SEPTEMBER 1960

Precision Metal Molding

INCLUDING DIE CASTINGS MAGAZINE

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1965

Foreign Competition
General Business Decline
Competitive Materials

SIXTH ANNUAL

DIE CASTING FORECAST

More Diecastable Metals, New Uses
Better Finishes / Increased Labor Costs
Improved Die Steels / More Castings per Unit
Increased Machine Automation

1950

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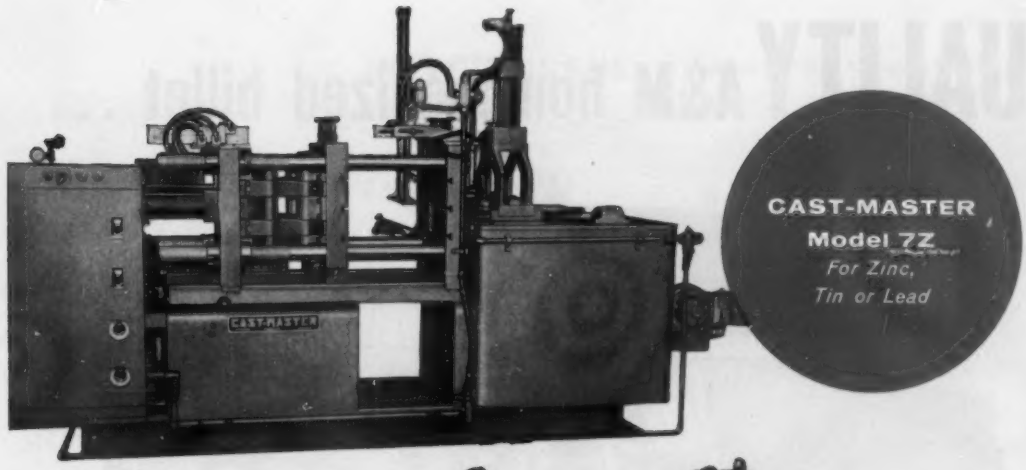

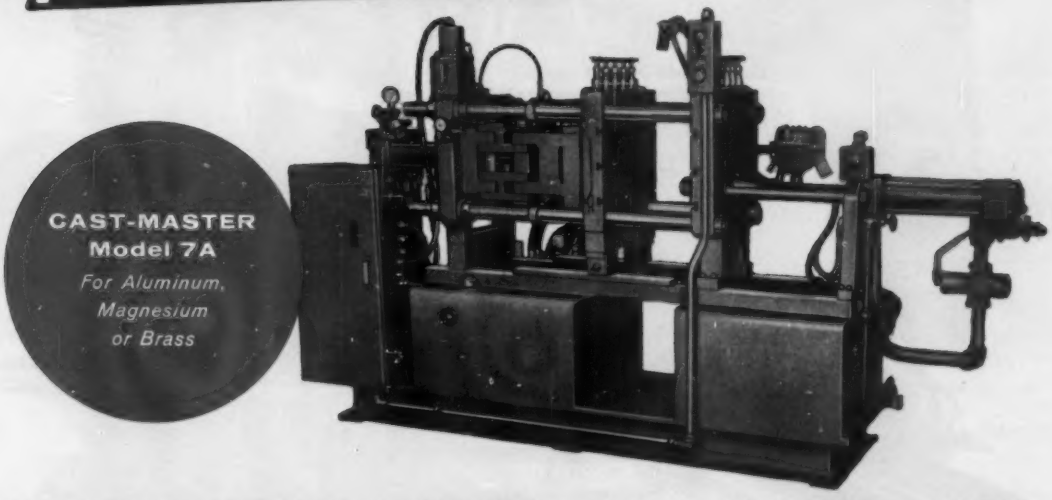

HARDWARE FINISH CASTINGS ON A VOLUME BASIS

SPECIFICATIONS

	Model 7Z	Model 7A
Die Locking Pressure	100 tons	100 tons
Distance between rods HxV	13½" x 13½"	13½" x 13½"
Tie rod centers, HxV	16" x 16"	16" x 16"
Tie rod diameter	2½"	2½"
Die mounting plates, TxHxV	3½" x 21½" x 21½"	3½" x 21½" x 21½"
Die thickness	4" min., 19" max.	4" min., 19" max.
Die stroke	4" min., 8" max.	4" min., 8" max.
Shot position	On center or 4" below	3½" below center
Shot cyl. dia.	2½"	3⅛"
Shot cyl. stroke	6½"	11"
Machine size, WxLxH	48" x 120" x 72"	48" x 120" x 58"
Weight, gross	6,900 lbs.	6,400 lbs.

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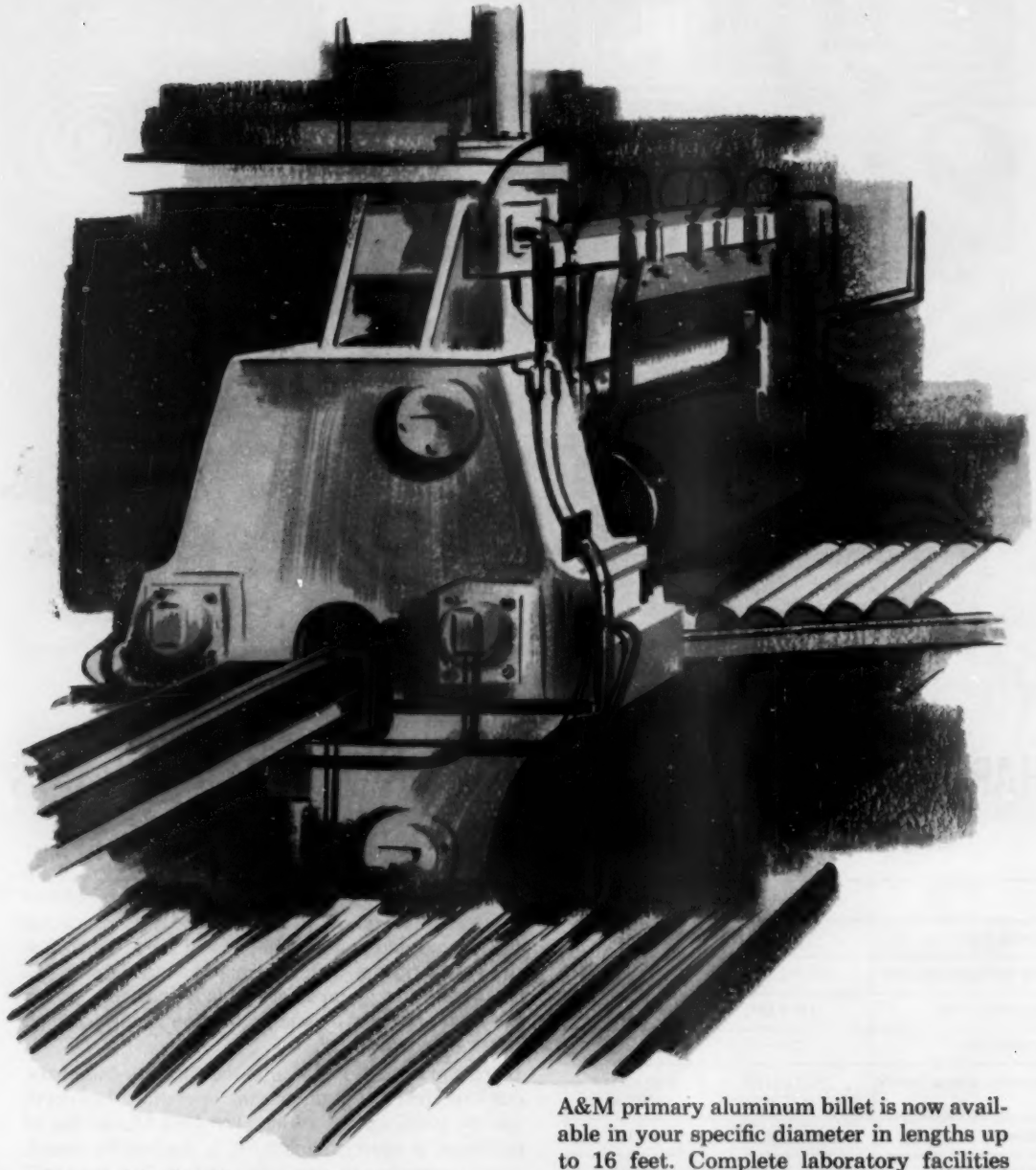

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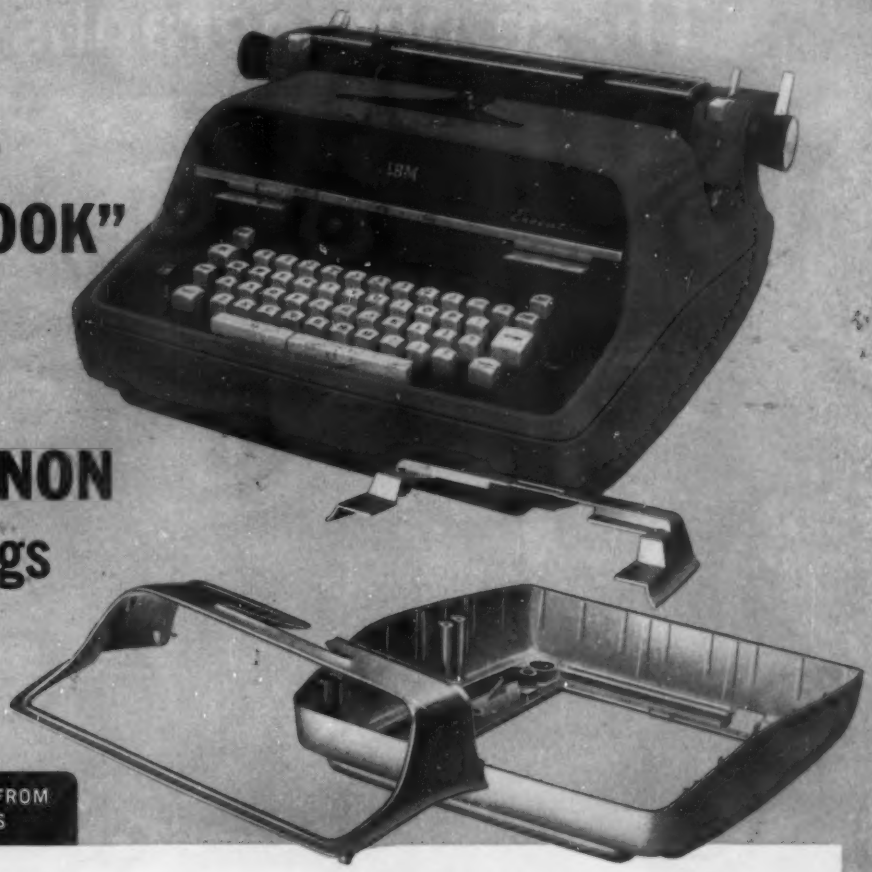
IBM's "NEW LOOK" enhanced with MT. VERNON Die Castings



CASE HISTORIES FROM MT. VERNON FILES

Behind the sleek silhouette of the dramatically new IBM electric typewriters is "more than a quarter of a century of experience . . . a combination of styling and engineering advances" that promise — and deliver — better performance and easier typing.

For its enclosure IBM knew what it wanted: a new high in eye-pleasing design combined with the many low cost, production benefits of die-casting. It was only natural that, for these die castings, once again, they turned to Mt. Vernon, a reliable supplier to IBM for over 25 years.

And, once again, they found Mt. Vernon's co-ordinated four-fold service — designing, die making, casting, and machining—equal to the job of meeting their strict requirements: strong, gracefully arched, thin-walled, large aluminum sections that match and fit perfectly. The three castings that cradle and enclose the intricate typewriter mechanism are delivered completely machined, ready for finishing.

Like IBM, leading manufacturers in all industries know and rely on Mt. Vernon's experienced use of its complete facilities for die cast zinc and aluminum parts ready for assembly. These services, all under one roof in 200,000 square feet of space, may hold the answer to your design and production problems. Think about it . . . and let us know. We'll gladly talk it over, without obligation. Just call your nearest Mt. Vernon sales representative.

DIE CASTING RESEARCH PARTICIPANT

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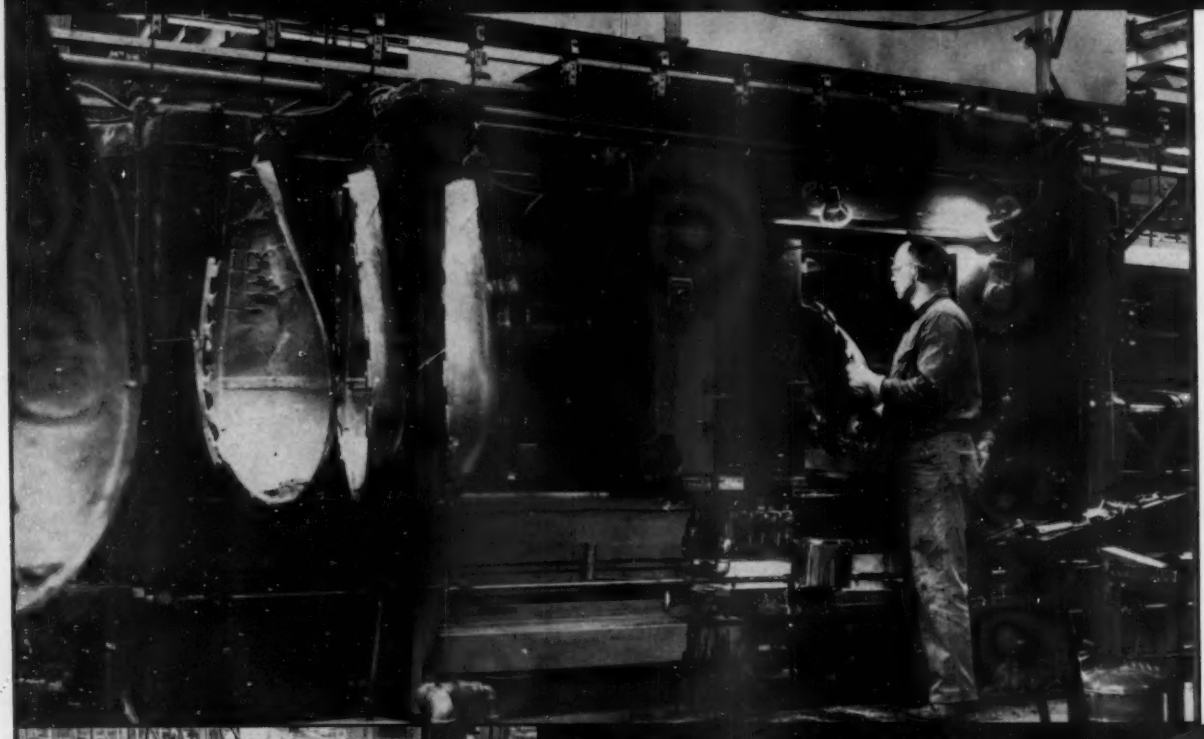
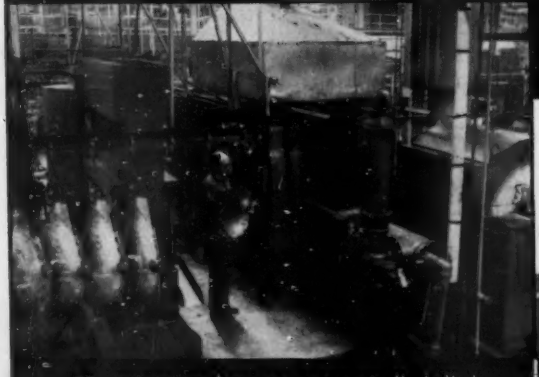
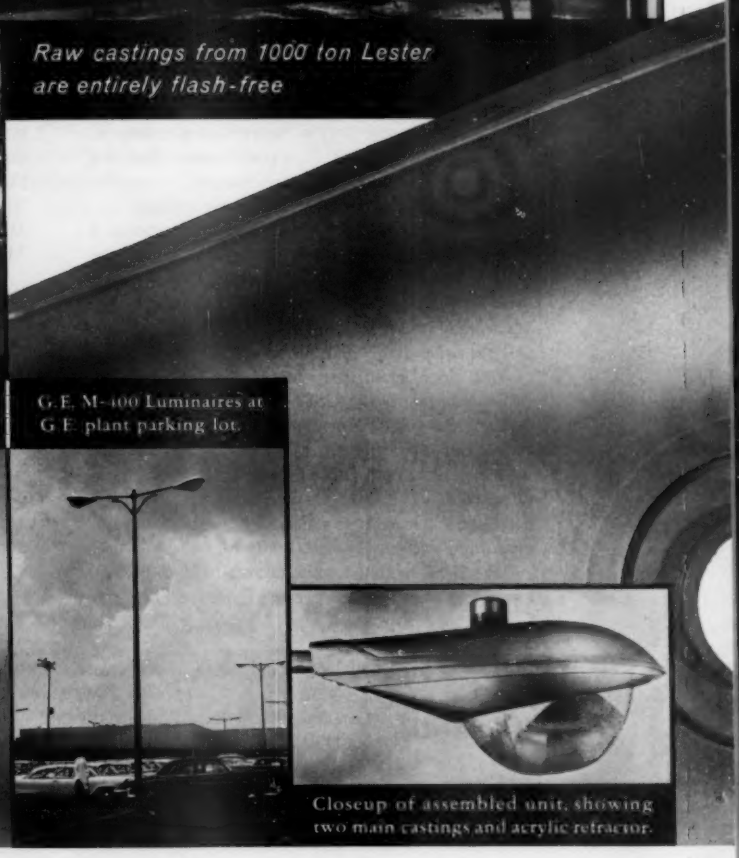
These photographs tell a....



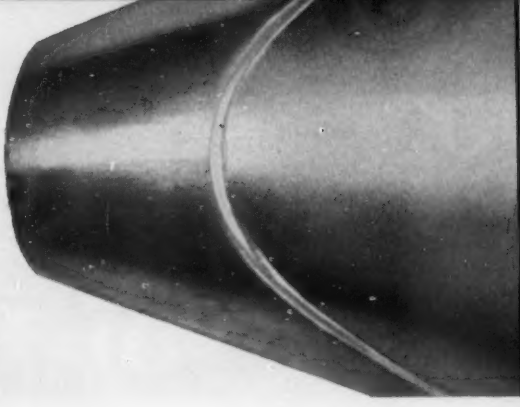
Raw castings from 1000 ton Lester are entirely flash-free



50 castings per hour are automatically ladled and removed by conveyor take-off.



G.E. M-400 Luminaires at G.E. plant parking lot.



Closeup of assembled unit, showing two main castings and acrylic refractor.

Sensational Die Casting Story!

General Electric Produces Biggest, Thinnest Flash-Free Commercial Die Casting Ever Made...On 1000 Ton LESTER

The parts in the installation photo at the left are aluminum die castings, untouched and untrimmed. *They are completely flash-free!* The projected area including the biscuit, runners and overflow wells is 576 sq. in. The wall thickness is only .090". The part is the upper housing of the G.E. Mercury Luminaire, for outdoor lighting. Here's the kind of casting that really tests the ability of a machine to hold its full rated clamping tonnage.

To flow the metal properly through such a thin section, over such a broad area, and to achieve high "as cast" finish qualities, demands a high plunger speed and maximum metal temperatures. As a result, the effective fluidity of the metal is close to 80%. This taxes the clamping capacity of the machine to its limits. How does the Lester HP-3½X-40C-SF perform? Let Mr. E.W. Denison, Manager- of Manufacturing Engineering at the G.E. plant in Hendersonville, North Carolina, give the answer:

"Two weeks after receiving this 1000 ton machine, we were able to ship the finished product to our customers. This record was made possible by Lester-Phoenix fine field service and the superb design and quality of this machine. The rugged die locking mechanism has enabled us to utilize the full 1000 ton locking pressure, thereby permitting us to produce the world's largest die casting."

The risk of giving away tons of aluminum from so-called "normal blow-back" is great in a part like this. Yet the record at G.E.—and at all other Lester installations—is assurance that Lesters have the guts to prevent flash and overweight castings.

Write for new Bulletin 102 with complete specifications on Lester Machines from 100 ton to 1600 ton capacity.

Another "lighter"—photographed at the same scale, to show the comparative size of this casting.

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THE CURIOUS CASE OF INTERMITTENT HARDNESS

Another costly mystery—solved by the man from Kaiser Aluminum

THE PUZZLING FACTS. A manufacturer of aerial camera brackets recently found himself in a quandary. An intermittent hardness condition had developed on his castings made from aluminum alloy 2356-T6. This adversely affected the finish of the casting, shortened tool life, and increased machining time.

HOW THE CASE WAS SOLVED. What was the trouble? Upon personal investigation, the man from Kaiser Aluminum found it to be a combination of (1) inadequate furnace temperature control, (2) poor heat treating results due to varying delays before quenching and aging of castings. As soon as these procedures were corrected, production returned to normal.

WE LOVE A MYSTERY. This is one of many actual cases solved by Kaiser Aluminum working with a customer. Perhaps *you* have a mystery one of our technical engineers might help solve? He'll give you expert advice on any casting problem—including conversion from cast iron to aluminum, mold and die design, alloy selection, heat treatment, finishing, fluxing, metal transfer.

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PMM LETTERS

the readers' forum

SAFETY CLOTHES

To whom can we turn for information regarding safety equipment and clothing use in foundries and die casting departments? We are particularly interested in "molders shoes". Can you recommend manufacturers of such equipment?

Have you ever published articles regarding the die casting of aluminum heels for ladies shoes? If so, in what issues? Where can we obtain additional information?

What is the nature of the forthcoming Die Casting Convention in Detroit? What is the nature of the participants and could you have the organizing committee forward to us its publications?

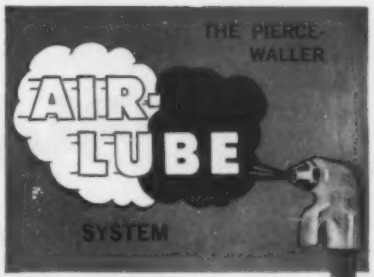
Your early response to the above questions will be very helpful to us.—Y.K. Omen Metal Products—Tel-Aviv.

I enclose a list of companies from whom safety clothing and safety shoes can be purchased. This list was furnished by one of our affiliated publications, OCCUPATIONAL HAZARDS MAGAZINE. *I am sure that these six companies can furnish you with safety equipment, clothing and shoes.*

Regarding material on die cast heels for ladies shoes. We have published very little on this subject; nor do I know where you can secure any information.

For the Die Casting Convention, if you will write to Mr. Stuart P. Hall, Hall Industrial Publicity, 23716 Woodward Ave., Pleasant Ridge, Mich., I am sure that you will get any information you desire.

Briefly, the National Die Casting Exposition & Congress will be a show at which die casters, manufacturers of die casting machines and equipment and suppliers to the die casting industry will have an opportunity to display their products. In addition, there will be technical sessions dealing with such subjects as die design, anodizing of die castings, vacuum die casting and many others of interest to people concerned with the manufacture and sale of die castings.—Ed.



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PMM CASTING ABOUT

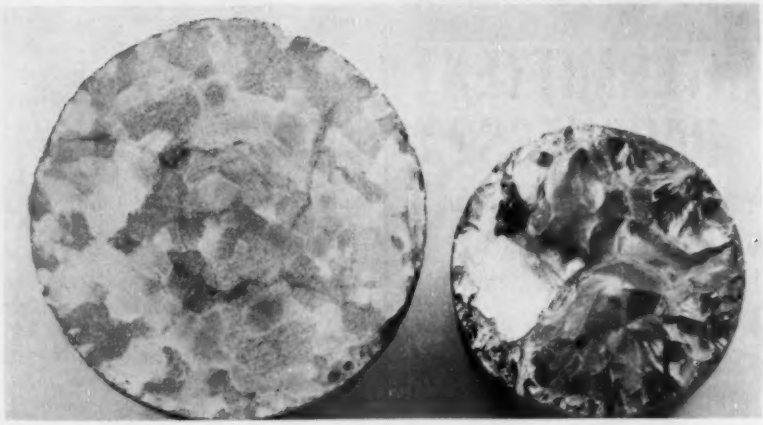
technical news of applications & processes involving precision metal molding

GRAIN REFINED TUNGSTEN IS WORKABLE

One of the major difficulties in the fabrication of the refractory metals and alloys has been the large grain size of the as-cast structure. This has led to low ductility, self-propagating cracks, and other fabricating troubles.

A new technique for greatly reducing the grain size in electron-beam melted and cast metals and alloys has resulted in improved working characteristics. The new method was developed by the Stauffer-Temescal Co., a subsidiary of Stauffer Chemical Co. It is applicable to both pure metals and to refractory alloys. The new production technique employs a combination of electron-beam processing and critical composition control.

Some grain-refined alloys such as 90-10 tantalum-tungsten have been grain-refined by electron-beam processes. The pure metals, however, particularly tungsten and molybdenum, still presented serious fabrication problems. The large crystals made deformation failures along lines of crystallographic weakness a common occurrence.



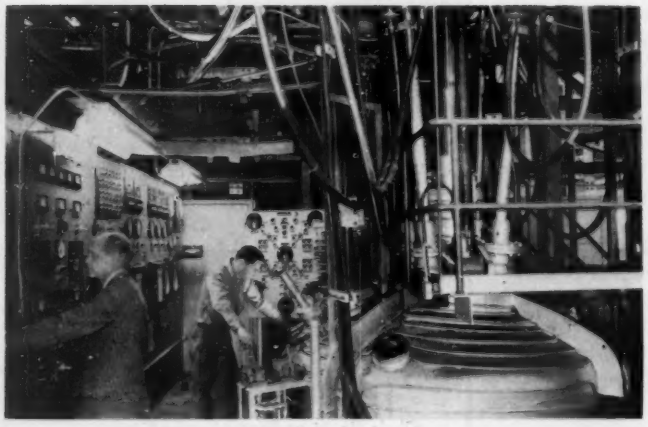
FINE GRAINED crystal structure in an ingot of tungsten cast by the new technique. Left, fine grained tungsten; right, coarse grained tungsten cast by conventional methods.

By reducing the grain size and securing random orientation of the crystals the tendency to rupture was greatly reduced. Because of the random orientation there is little chance that crystals will align along common planes. Working stresses are, therefore, more uniformly absorbed.

Another important improvement in both tungsten and molybdenum which has been grain refined is the increased ultimate strength. This improvement is noted in both the annealed condition and after 90% cold work.

Molybdenum cast by the new process does not require extrusion before closed die forging. Increased shock resistance in the finished products of molybdenum and tungsten has also been noted.

HELIUM-COOLED VACUUM FURNACE



The first helium-cooled vacuum melting furnace for processing reactive and refractory metals has been developed by National Research Corp. The furnace was developed for the recovery of titanium scrap.

The furnace provides for both skull melting by permanent electrodes and melting by consumable electrodes. Casting is done in the vacuum chamber.

The use of helium gas cooling instead of water cooling is an important safety factor. Molten titanium reacts explosively with water in the event of an internal leak.

Single pours of titanium up to 550 pounds have been made and 800 pound pours are believed possible with this first unit.

Other metals which may be melted include columbian, tantalum, molybdenum and tungsten.

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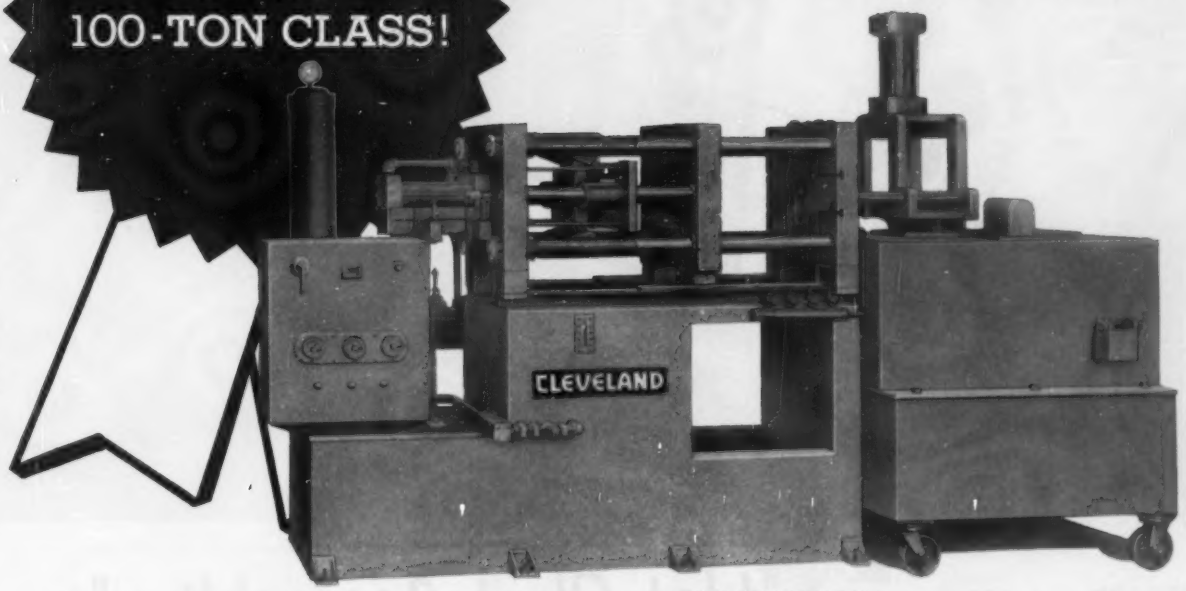
Model 100 Die Casting Machine

IT'S TOPS IN THE 100-TON CLASS!



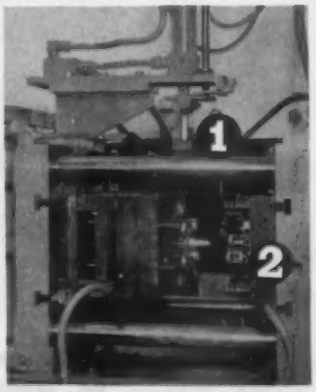
Many unique design features make this new 100-ton Cleveland tops in its class! With both the shot and die closing cylinders operated from the accumulator bottle, the Model 100 cycles well over 1000 shots per hour, depending on the type, size and complexity of casting. It is available any way you want it—as a standard, or automated, hot chamber machine; as a standard cold chamber machine; or as a cold chamber machine equipped with the Morton system of vacuum die evacuation, with or without automatic ladling.

The furnace mounts on casters so that it can be rolled away from the machine to remove the pot. In the operating position, locks on the casters prevent movement of the furnace. Note the minimum piping! Space is provided in the base of the machine for installing a single-unit water box and conveyor that will deliver castings to a bin or conveyor at the pump end of the machine. For hot or cold chamber casting, the machine is designed for two-position shot injection.

Most attractively priced, the new Model 100 gives you every modern feature, plus proven Cleveland dependability, for fast production of small size, hardware finish castings. Write direct, or call in a Cleveland field engineer, for full details.

MAJOR SPECIFICATIONS:

Size of Die Plates	22" x 23"
Die Thickness	19" max., 4" min.
Platen Thickness	3¾"
Tie Bar Dia.	2½"
Motor Hp.	15
Pump Capacity	22 gpm @ 1000 psi
Oil Reservoir Capacity	60 gal.
Shot Capacity	2.6 lbs. aluminum; 4.2 lbs. zinc with standard plungers. Other capacities with other size plungers.
Clamping Capacity	100 ton, strain gauge tested.



The Model 100 Cleveland can be automated to include such features as (1) stripper for removing the casting from the die; (2) automatic die lubrication, as well as low pressure die closing, water box and conveyor, automatic machine lubrication.

Sales Offices: Chicago • Cleveland • Detroit • Hartford • Springfield, N.J.

CLEVELAND AUTOMATIC MACHINE COMPANY
4952 Beech Street • Cincinnati 12, Ohio

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

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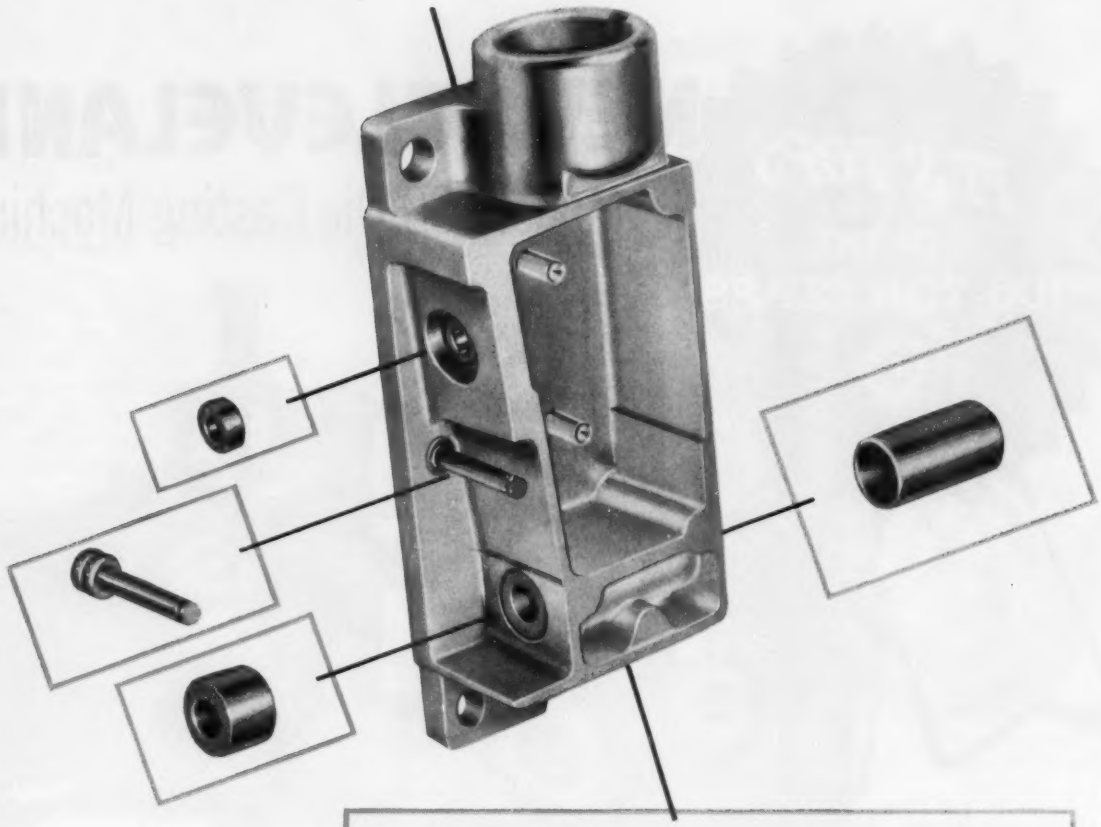

"Hot-Shot Assembling"

with MADISON-KIPP zinc and aluminum die castings

"Hot-shot assembling" is a shop term but it is literal, because inserts are put in place and liquid metal under high pressure is shot into the die to surround and anchor the inserts in the die casting.

In many cases the advantages of cast-in inserts provide substantial cost savings even though the casting process is slower than when no inserts are involved.

The seasoned and skilled Madison-Kipp mechanics have had long experience in "hot-shot assembling." They may be able to assist you in your problems.

Please clip this ad as a reminder to contact us when you have die casting requirements.

kipp

MADISON-KIPP CORPORATION
213 WAUBESA STREET • MADISON 10, WIS., U.S.A.

Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

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Unmatched purity and uniformity:

FEDERATED ZINC DIE CASTING ALLOYS

Completely controlled production provides you with die cast metals of highest purity and uniformity. Federated Zinc die cast metal is made from ASARCO Special High Grade Zinc, electrolytically refined by Asarco-developed processes. Production is concentrated "under one roof" at Corpus Christi, Texas, one of the world's largest plants producing Special High Grade zinc and die casting alloys. Strategically located warehouse stocks assure you of prompt volume delivery. For complete information about FEDERATED Zinc Die Casting Alloys, write or call: Federated Metals Division, American Smelting and Refining Company, 120 Broadway, New York 5, N. Y. or your nearby Federated sales office.

ASARCO

AMERICAN SMELTING AND REFINING COMPANY

Low machining costs, superior castability, and an excellent plating surface are the big reasons why zinc die castings are favored for fuel pumps, carburetors, grilles, lamp housing, instrument panels, horn rings, and many other functional and decorative automotive components.

FEDERATED METALS DIVISION

Where to call for information:

ALTON, ILLINOIS
Alton: Howard 5-2511
St. Louis: Jackson 4-4040

BALTIMORE, MARYLAND
Orleans 5-2400

BIRMINGHAM, ALA.
Fairfax 2-1802

BOSTON 16, MASS.
Liberty 2-0797

CHICAGO, ILL. (WHITING)
Chicago: Essex 5-5000
Whiting: Whiting 826

CINCINNATI, OHIO
Cherry 1-1678

CLEVELAND, OHIO
Prospect 1-2175

DALLAS, TEXAS
Adams 5-5034

DETROIT 2, MICHIGAN
Trinity 1-5040

EL PASO, TEXAS
(Asarco Mercantile Co.)
3-1852

HOUSTON 29, TEXAS
Orchard 4-7611

LOS ANGELES 23, CALIF.
Angelus 8-4291

MILWAUKEE 10, WIS.
Hilltop 5-7430

MINNEAPOLIS, MINN.
Tuxedo 1-4109

NEWARK, NEW JERSEY
Newark: Mitchell 3-0500
New York: Digby 4-9460

PHILADELPHIA 3, PENNA.
Locust 7-5129

PITTSBURGH 24, PENNA.
Museum 2-2410

PORTLAND 9, OREGON
Capitol 7-1404

ROCHESTER 4, NEW YORK
Locust 5250

ST. LOUIS, MISSOURI
Jackson 4-4040

SALT LAKE CITY 1, UTAH
Empire 4-3601

SAN FRANCISCO 24, CALIF.
Atwater 2-3340

SEATTLE 4, WASHINGTON
Main 3-7160

WHITING, IND. (CHICAGO)
Whiting: Whiting 826
Chicago: Essex 5-5000

IN CANADA: Federated Metals Canada, Ltd.
Toronto, Ont., 1110 Birchmount Rd., Scarborough, Phone: Plymouth 73246

Montreal, P.Q., 1400 Norman St., Lachine, Phone: Melrose 7-3591

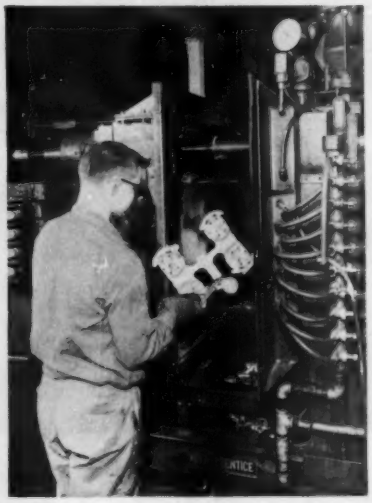
Circle No. 9 on Reader Service Card

REED-PRENTICE

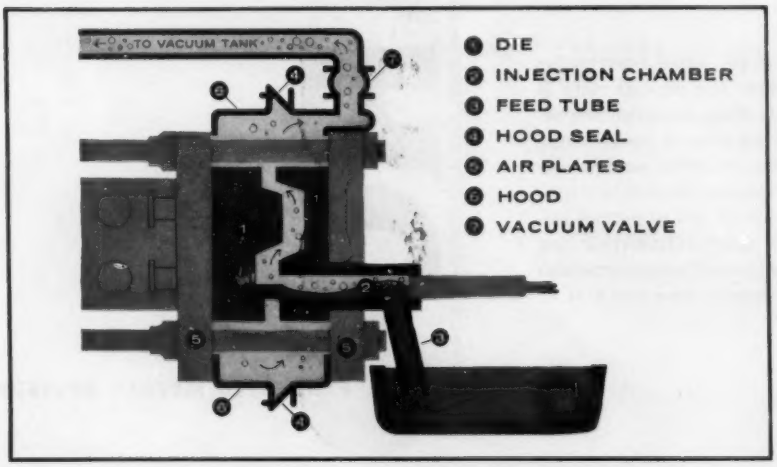
DIE CASTING NEWSLETTER

a look at vacuum die casting, its use and importance.

Vacuum die casting of aluminum offers as much promise for product design as vacuum die casting of zinc has in the past few years. Major improvements such as cleaner, lighter castings from a new spectrum of aluminum alloys make possible the use of new finishing operations as applied to die casting. In general, greater liberties can be taken with part design. Compositions that can be anodized, heat treated or brazed can now be successfully die cast. Improved tensile strength and uniformity make thinner walls and less support-metal practical.



REED-PRENTICE has developed an automatic vacuum feed system that successfully combines vacuum die casting of aluminum with automatic ladling. This VACUFEED system, as the diagram shows, first transfers the aluminum from the furnace to the injection chamber in a fully enclosed passage maintained at pouring temperature. This protects the metal from oxidation and temperature fluctuation. Second, the molten metal is drawn from below the surface of the melt. There is no inclusion of the surface dross to impair the properties of the die casting. And third, each shot of molten aluminum is accurately metered.



The field for vacuum die cast aluminum parts is broad and growing—from thin, colorful, automotive trim strips and grill decorations to small watch cases, appliance parts and electronic components. REED-PRENTICE VACUFEED enables engineers to specify vacuum cast aluminum parts—with all the inherent die casting advantages—for designs and compositions never before considered. REED-PRENTICE engineering has pioneered to find the best way to die cast aluminum with a vacuum. The advantages are many, the savings greater and, most important, the complete equipment is manufactured by REED-PRENTICE. Complete details on the techniques of VACUFEED die casting is as close to you as your nearest REED-PRENTICE Sales Engineer. Call him today.

REED-PRENTICE

.....*division of*

EAST LONGMEADOW, MASSACHUSETTS

PACKAGE MACHINERY COMPANY

BRANCH OFFICES: NEW YORK • CHICAGO • BUFFALO • CLEVELAND • DEARBORN • KANSAS CITY • LOS ANGELES

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V-R Investment Castings...

Intricate shapes...

Do your specifications call for parts that are too complex to machine profitably? Then you should invest a little time with us to hear about V-R Investment Castings. Our method of investment casting accurately reproduces odd-shaped parts that are uneconomical to machine in large quantities. This allows your engineers greater design freedom because it eliminates secondary operations. Material is no problem either . . . parts can be cast from Tantung, steel, beryllium copper, stainless steels and many other materials. Send us a sample or, better yet, a parts drawing. We'll give you the *complete story* on V-R Investment Castings.

CREATING THE METALS THAT SHAPE THE FUTURE

VASCOLOY-RAMET

824 MARKET STREET WAUKEGAN, ILLINOIS

I-797

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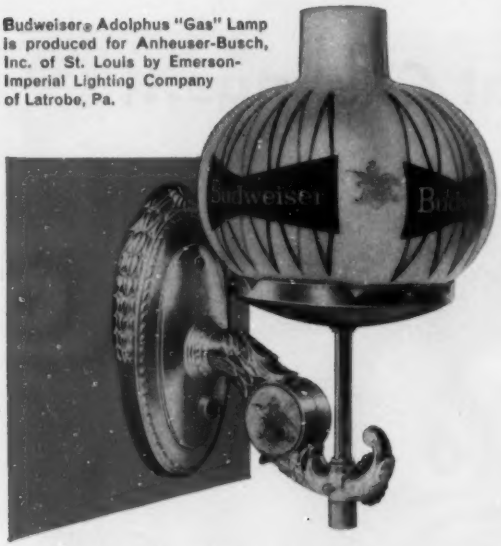
Budweiser® Adolphus "Gas" Lamp is produced for Anheuser-Busch, Inc. of St. Louis by Emerson-Imperial Lighting Company of Latrobe, Pa.



L. D. C. ZINC ALLOY DIE CASTINGS

add a bright new light to an effective sales technique

Here's point-of-sale advertising at its best—commandeering attention and holding its enviable and permanent position in the center of a highly competitive consumer market—creating impulses that roll into steady sales—continuously!

Yes, Budweiser® Adolphus "Gas" Lamps by Anheuser-Busch, Inc., do just that—doubly so, because they're installed in pairs, flanking the ends of thousands of backbars across the country.

So you order a "Bud"®, and your eyes dance over the quaint old-fashioned design of the Lamp's base, as you wait to be served. How sharp the minute details of the design in the base appear—and are! The smooth, even fit of the parts . . . the soft, golden finish that glistens so bright . . .

Now you know! That elegant, ornate base is L. D. C. Zinc Alloy Die Casting! It has captured and preserved all the warmth and friendliness of a Century passed through modern design techniques and color treatment that only quality workmanship through quality materials can produce.

L. D. C. Zinc Alloy Die Castings electroplate easily and retain a high gloss polished finish.

Dimensional stability and strength of L. D. C. Zinc Alloy Die Cast shells assure neat, accurate fit, and a smooth, even finish that sharpens design details.

Latrobe Die Casting Co.
LATROBE, PENNSYLVANIA

DISTRICT OFFICES:

AKRON, OHIO
E. G. Siess, Jr.
227 W. Exchange St.
Tel: Portage 2-7663

CLEVELAND, OHIO
William Kranz
20001 West Lake Road
Tel: Edison 1-6888

DETROIT, MICHIGAN
J. R. Lemen, Jr.
1016 Fisher Bldg.
Tel: Trinity 3-5910

NEW ENGLAND
R. L. Thomson
741 Glenbrook Rd.
Glenbrook Station
Stamford, Conn.
Tel: Fireside 8-3985

BUFFALO, N. Y.
Harry W. Harding
235 Burke Drive
Tel: Amherst 1164

DAYTON, OHIO
J. M. Gallaher
363 West First St.
Tel: Baldwin 4-3523

PHILADELPHIA, PA.
Albert B. Reid
505 Wadsworth St.
Tel: Chestnut Hill 7-8833

Established 1918

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IT'S LIGHTER THAN YOU THINK!

SMOOTH-FLOWING DESIGN . . . BRIGHT, LASTING FINISH
RIGID . . . DURABLE . . . ECONOMICAL

. . . WHEN DIE CAST with ZAMAK

Airfoil sculptured styling of today's automobiles demands parts designed to complement flowing body and fender lines.

ONLY ZINC DIE CASTING ALLOYS can produce the intricate shapes and smooth, compound-curve surfaces—as in this headlight door — with the necessary thin-wall sections, strength, rigidity and production economy.

Improved techniques in chromium plating on Zamak die cast parts provide a more permanent bright finish with greater resistance to corrosion than ever before.

The weight-saving advantages of ZINC die castings, with built-in qualities of durability and economy, point up the important reasons why Zamak has become the leading material for the production of die cast parts in today's automobiles.

HORSE HEAD® SPECIAL ZINC AND HORSE HEAD ZAMAK ARE PRODUCED BY

THE NEW JERSEY ZINC COMPANY

DEVELOPERS OF THE ONLY STANDARD ZINC DIE CASTING ALLOYS IN USE TODAY

160 Front Street • New York 38, N. Y.

HORSE HEAD PRODUCTS ®

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FIRST

SDCE '60

SDCE

NATIONAL DIE CASTING EXPOSITION & CONGRESS

NOVEMBER 8-11, 1960
DETROIT ARTILLERY ARMORY

AN UNPRECEDENTED OPPORTUNITY FOR

Die Casting Engineers

Die Casting Plant Management

Buyers of Die Castings

Metalworking Production Executives

Tool and Manufacturing Engineers

Die Casting Designers and Stylists

to **SEE, STUDY** and **LEARN** about the latest developments and trends in the dynamic die casting field.

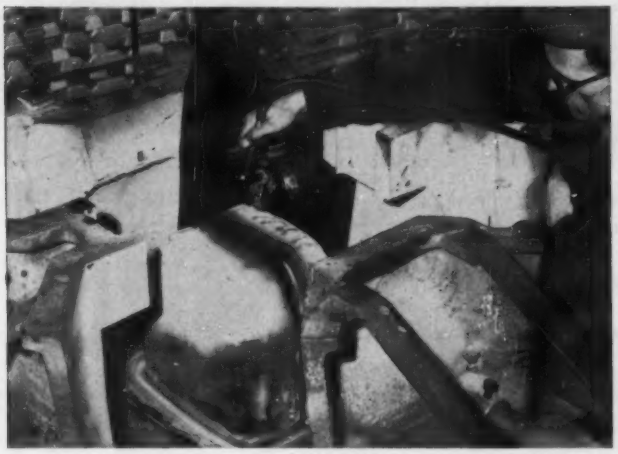
EXHIBITS of die castings, die casting machines, dies, die steels, casting metals, production and finishing equipment, and die casting supplies and services.

A COMPREHENSIVE TECHNICAL CONGRESS

with 25 papers by outstanding authorities. Vital subjects to be discussed in the Congress include: Die Design, Die Building, Metallurgical Developments, What's Ahead in Die Castings, Competition to Die Casting, Cost and Profit, Quality Control and Vacuum Die Casting.

For further **INFORMATION** write or call The Society of Die Casting Engineers, 19382 James Couzens Highway, Detroit 35, Michigan, UNiversity 4-9116

AQUADAG® SOLVES AN INTRICATE MOLD PROBLEM FOR OSWEGO CASTINGS



A complete permanent mold, used in casting high-pressure gas meter housings, is shown being sprayed with 'Aquadag'.

The problem at Oswego Castings Corporation, Oswego, New York, a division of Oberdorfer Foundries, Incorporated, involved the effective metal flow and release of aluminum castings. Frequent breakage occurred due to the complexity of the part . . . a gas meter housing containing an integral rib down the center. In the mold core, the relatively tiny aperture for forming the rib, plus the rounded corners which provide the outer "bucket" appearance to the housing, demanded a release agent that would permit easy extraction and proper metal flow.

According to Frank Fox, Production Foreman in the Oswego foundry, previous to adopting the use of an Acheson dispersion, removing the aluminum casting from the rib aperture took as long as three or four hours. Even with such care, sticking caused many castings to break at the point of the rib.

There was also the problem of metal flow. Housing walls vary in thickness between ¼ inch and the ⅝ inch flange which runs around the top. Close tolerances must be maintained to insure a proper fit during final assembly. "Holidays" caused by the improper flow of metal into critical areas of the cavity, presented a constant reject problem.

Several mold washes were tried unsuccessfully before Oswego engineers turned to 'Aquadag'—a dispersion of colloidal graphite in water. In their application, Oswego dilutes the concentrated material 1 to 3 with water. Normal commercial spray equipment is used in applying an even coating on all mold surfaces . . . one coating holding up through a run of eight to ten pieces. The 356 aluminum alloy used for the housing castings, is poured at 1400°F. The mold is preheated to 700°F. and maintained at that temperature through the casting cycle.

With 'Aquadag', the savings at Oswego have been "considerable". Castings are more uniformly formed, have smoother surface finish, and part easily. Because of greatly facilitated metal flow and release, mold life is lengthened. Rejects are the exception rather than the rule.

Oswego Castings manufactures several products with highly defined parts which require molds having intricate sliding members or collapsible cores. The fact that finding the effective lubricant they needed to overcome their *most difficult* problem, resulted in the selection of an Acheson product . . . indicates it can be of equal value to you. We invite your inquiry.

Literature Describes Production Economies In Metal Casting

A detailed discussion of the various Acheson semi-colloidal and colloidal dispersions available for coating permanent molds, die cavities, and steel and cast-iron chills, is contained in Acheson Bulletin 425. It describes why Acheson colloidal graphite is so extensively used as a mold and die lubricant, as well as an extremely effective heat-resistant parting agent. The microscopically fine graphite particles are suspended in a variety of liquid carriers. When mixed with the appropriate diluent, the dispersion can be conveniently applied by spraying, brushing, dipping, or swabbing. As mold coatings they provide greater, more uniform surface coverage. Highly tenacious, these thin coatings resist the scouring action of molten metal, do not volatilize, and will not build up. Sticking in the mold is reduced to a minimum; usually eliminated completely. Less finishing is required, rejects are fewer, and die and mold life is extended.

Additional protection of casting machines, conveyor chains, and other plant equipment is also described in Bulletin 425. The heat-resistant, non-gumming characteristics of Acheson colloidal graphite are ideally suited for the high operating temperatures of most foundry machinery. Should yours be a special lubricating problem not covered in this literature, let us hear from you. Industry experience has been that in our complete product line there is an Acheson dispersion "tailor-made" for your metal casting application.

We invite you to send for your copy of Bulletin 425, "Colloidal Dispersions For Use In Metal Casting", at your earliest convenience. It should prove helpful to you in realizing greater production economies. Write direct to Dept. PM-90.

'dag', 'Aquadag' are trademarks registered in the U.S. Patent Office by Acheson Industries, Inc.

ACHESON

dispersions digest reporting uses for

dag® BRAND DISPERSIONS

ACHESON Colloids Company PORT HURON, MICHIGAN

A division of Acheson Industries, Inc. Also Acheson Industries (Europe) Ltd. and affiliates, London, England

Offices in:

Boston • Chicago • Cleveland • Dayton • Detroit • Los Angeles • New York • Philadelphia • Pittsburgh • Rochester • St. Louis

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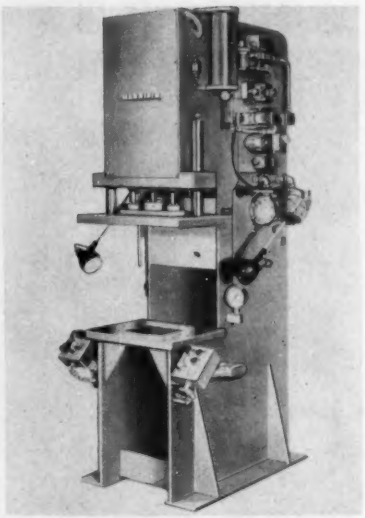
NEW PRODUCTS AND DEVELOPMENTS

Qualified readers can get complete details on these products.

Use the Reader Service Cards facing page 82 of this issue



HIGH-SPEED HYDRAULIC TRIMMING PRESS

HANNIFIN CO.—This press for trimming die castings is part of a new line of high speed hydraulic assembly and trimming presses. High speed production for greater cost savings per labor hour is the theme behind their design.

This particular model can perform unusual trimming operations at exceptionally high speeds. It can also use tooling taken from OBI presses without change to that tooling. As a further advantage, the press can be mounted on wheels and moved from job to job.

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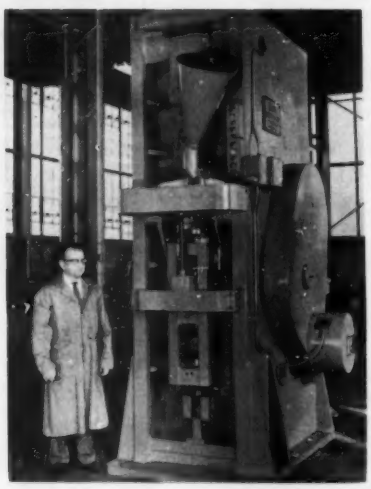

COMPACTING PRESS HAS 125-TON EJECTION CAPACITY

KUX MACHINE COMPANY—This heavy duty, 125-ton, mechanical compacting press is designed for automatic, continuous, or single-cycle production. It applies the compacting pressure with both upper and lower punches and ejects the compact at the full-rated tonnage.

A dwell under compression of the compact is provided by a cam pause mechanism. This holds the formed compact under the pressures of both punches while it sets, resulting in more uniform compact size and higher density.

The electrically operated clutch-brake unit allows push button, stop-start control with inching during tooling set-up. Rheostat control permits setting the power of the clutch to suit the compact being made. In case of over loading, the clutch will automatically slip and stop the press.

Parts up to 6" in diameter can be produced at the rate of 12 per minute. Kux produces other compacting presses in both mechanical and hydraulic models. They range from 10 to 500 tons pressure capacity.

Circle No. 236 on Reader Service Card

ELECTROLYTIC PROCESS UNIT

ALLEN AIRCRAFT PRODUCTS, INC.—The Model 500 Allen-Dizor multi-purpose, electrolytic process unit is used for laboratory sample preparation or research, and for experimental or short run production.

Designed primarily for hard anodizing, it can also be used for sulphuric and chromic anodizing, straight electroplating, chemical and electrochemical milling, electro-polishing, electrolytic cleaning and etching.

Typical uses include hard anodizing of aluminum molds, dies, or wear plates, and salvaging machine or production parts with hard chromium plate or hard anodizing. One company uses the unit to recover valuable aluminum parts containing a broken tap or drill by anodic "de-plating" of the tool steel.

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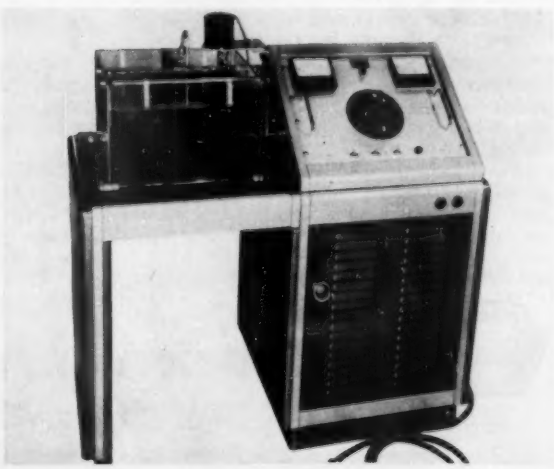
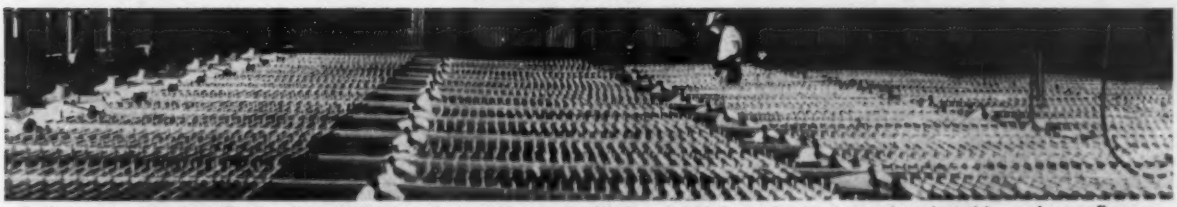
continued on page 74



INTEGRATED PRODUCTION—from Ore to Ingot

Underground scene in American Zinc's East Tennessee zinc mines. More than 50 years' reserve of zinc ore has been developed here.

Assures the Uniformity and Purity of



Cell room in American Zinc's electrolytic zinc plant at Monsanto, Ill. Special high-grade zinc is produced at this modern refinery.

AZCO Zinc Die Cast Alloys

Latest spectrographic analyzing equipment is employed to assure accurate control of alloys at all times.

You set your specification—get your specification with AZCO Zinc Die Cast Alloys. AZCO Alloys are produced from American Zinc special high-grade slab zinc—quality controlled from ore to ingot to assure the purity and uniform analysis you need for trouble-free production. From our Monsanto, Illinois, plant in the center of the "Zinc Zone," you get the fast, dependable service you need to meet your production schedules. Phone for immediate attention.

American Zinc sales company

1515 Paul Brown Building, St. Louis 1, Missouri
Distributors for:
AMERICAN ZINC, LEAD AND SMELTING COMPANY
Detroit • Columbus, O. • Chicago • St. Louis • New York

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Novate (Milano)
Italy
Via Vialba. 56
Telephone 3 49 16 61/2/3/4
3 49 17 85/6/7/8
Telegraph TRIULZIPRES
NOVATE
MILANESE

TRIULZI

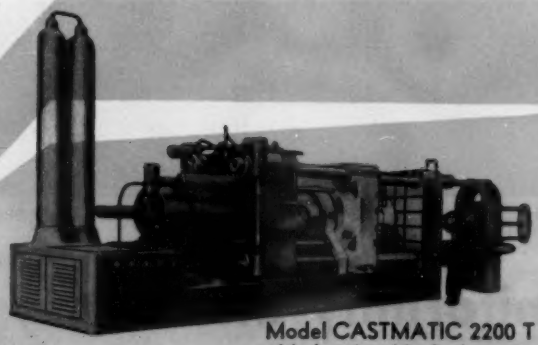
castmatic

DIE CASTING MACHINES

- hot chamber—from 33 to 880 short tons
- cold chamber—from 33 to 2500 short tons

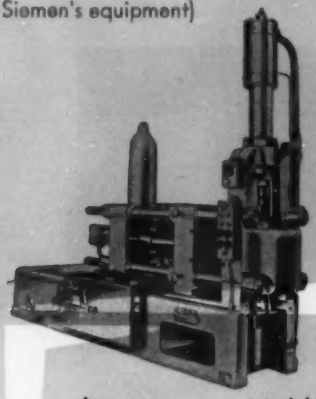
OIL HYDRAULIC, SELF CONTAINED
(with Vicker's equipment)

AUTOMATIC
with preselecting panel for 8 different working programs (with Siemen's equipment)



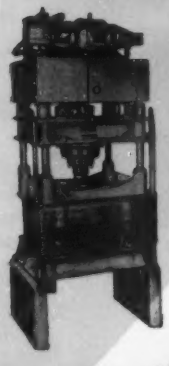
Model CASTMATIC 2200 T
cold chamber blocked piston, positive clamping system

- locking force—2500 short tons
- max. casting weight—110 pounds
- platen dimensions—72-4/5 x 76-3/4 inches
- max. daylight between open platens—98-1/2 inches
- mobile platen stroke—59 inches



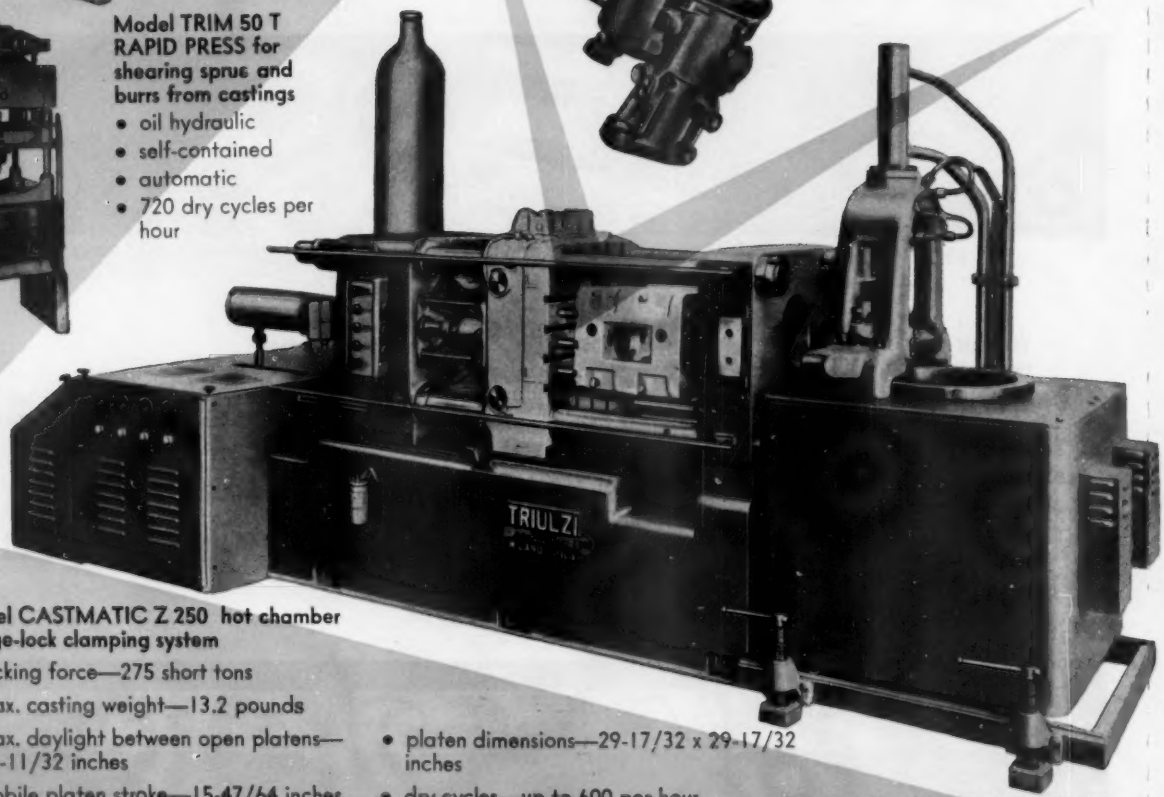
Model CASTMATIC P 150
cold chamber
toggle clamping system

- locking force—165 short tons
- max. casting weight—5.5 pounds
- dry cycles—1140 per hour



Model TRIM 50 T
RAPID PRESS for shearing sprue and burrs from castings

- oil hydraulic
- self-contained
- automatic
- 720 dry cycles per hour



Model CASTMATIC Z 250 hot chamber wedge-lock clamping system

- locking force—275 short tons
- max. casting weight—13.2 pounds
- max. daylight between open platens—41-11/32 inches
- mobile platen stroke—15-47/64 inches
- platen dimensions—29-17/32 x 29-17/32 inches
- dry cycles—up to 600 per hour

ALL TRIULZI MACHINES CAN BE SUPPLIED WITH:

★ vacuum equipment
★ automatic ladling device for cold chamber machines

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Visit us at the SALONE INTERNAZIONALE DELLA TECHNICA — TORINO 1960 — from Sept. 22 to Oct. 2, 1960 Hall 5 Stands No. 1699-1676-1677-1678

Also, visit us at the B.I.M.U. — BIENNALE ITALIANA MACCHINE UTENSILI — MILANO 1960 — on October 4-7, 1960. Hall 3 & 4 Stands No. 3101-3102 & 4010 (outside stand).

with America's finest facilities, equipment and men producing America's highest quality molds for the Die-Casting and Plastics Industries

ATOLS
Ultra-Precision
MOLDS

Yes, an all new plant, doubling previous floor area and increasing traveling crane capacity to 20 tons, equipped with the industry's most advanced tools, yet staffed by the same experienced men who have earned the praise of the nation's leading blue chip companies. We are proud of our new building but we take even greater pride in that many of the same companies whom we served at the very beginning of ATOLS are still our most valued customers. We dedicate our building to them and to those of you who take advantage of our invitation to investigate our facilities, our skill, our service.

For more than 25 years ATOLS has designed and produced precision made molds promptly and economically. We offer a complete service from design and engineering to the finished mold, with more than 100 men to serve you.

For complete details of our services and facilities, simply call or write. Your request will be answered promptly and courteously.

ATOLS TOOL and MOLD CORPORATION

3828 RIVER ROAD • Phone NAtional 5-6300 • SCHILLER PARK, ILLINOIS

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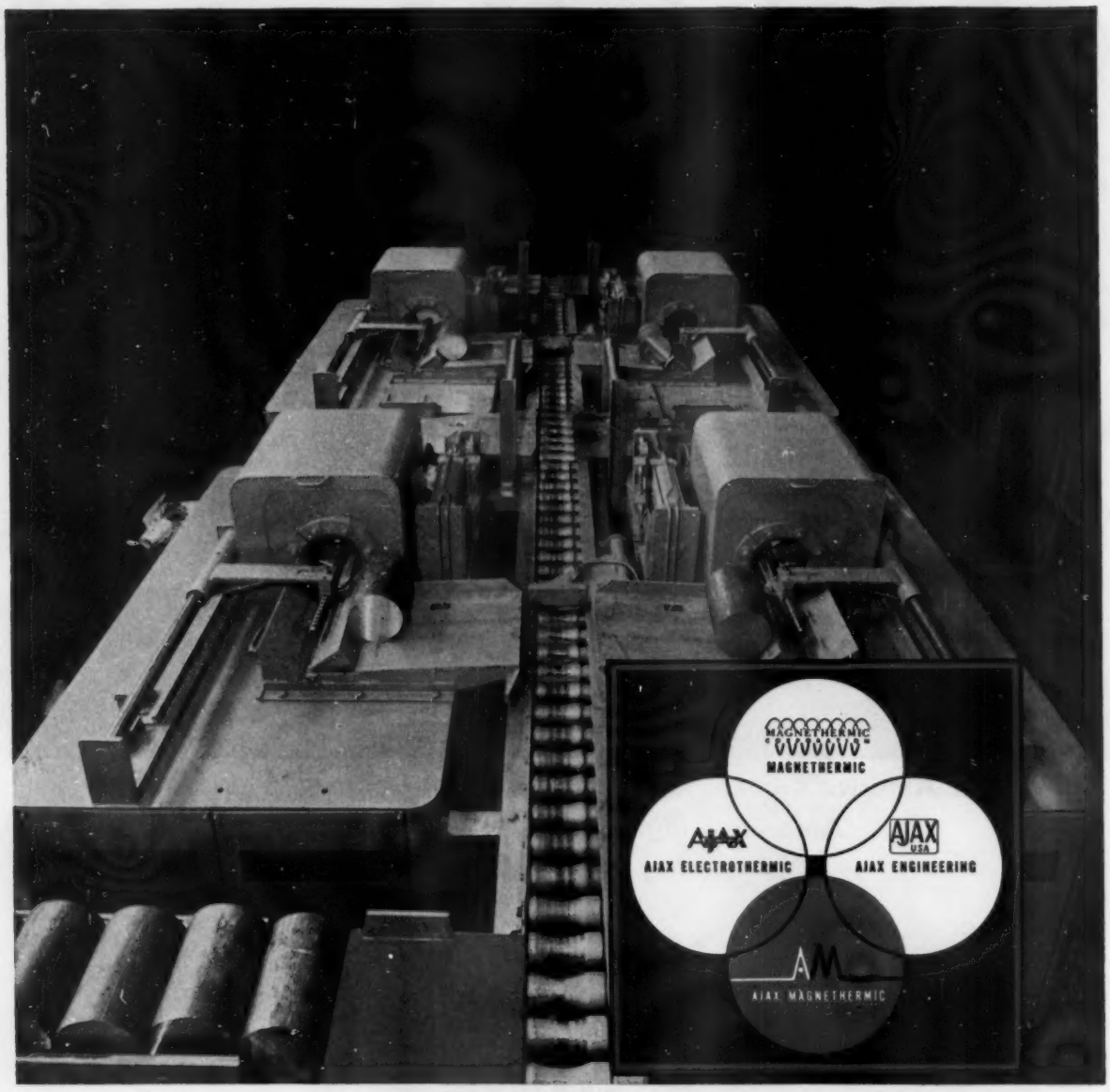

At Scovill Manufacturing Company, Waterbury, Connecticut, these four Ajax Magnethermic Induction Heaters heat 9" x 16" copper and brass billets for a 2500 ton extrusion press at the rate of 60 billets per hour. Each heater is rated 450 KW. The four heaters in tandem are served by a common loading and unloading conveyor.

THE NEW NAME WITH THE FAMILIAR RING!

60-Cycle Induction Billet Heaters manufactured by AM, one of our many products for induction heating or melting of all types of metals.

"induction heating is our only business"

Ajax Magnethermic CORPORATION

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TRENTON DIVISION
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Trenton 5, New Jersey

YOUNGSTOWN DIVISION
3990 Simon Road
Youngstown 1, Ohio

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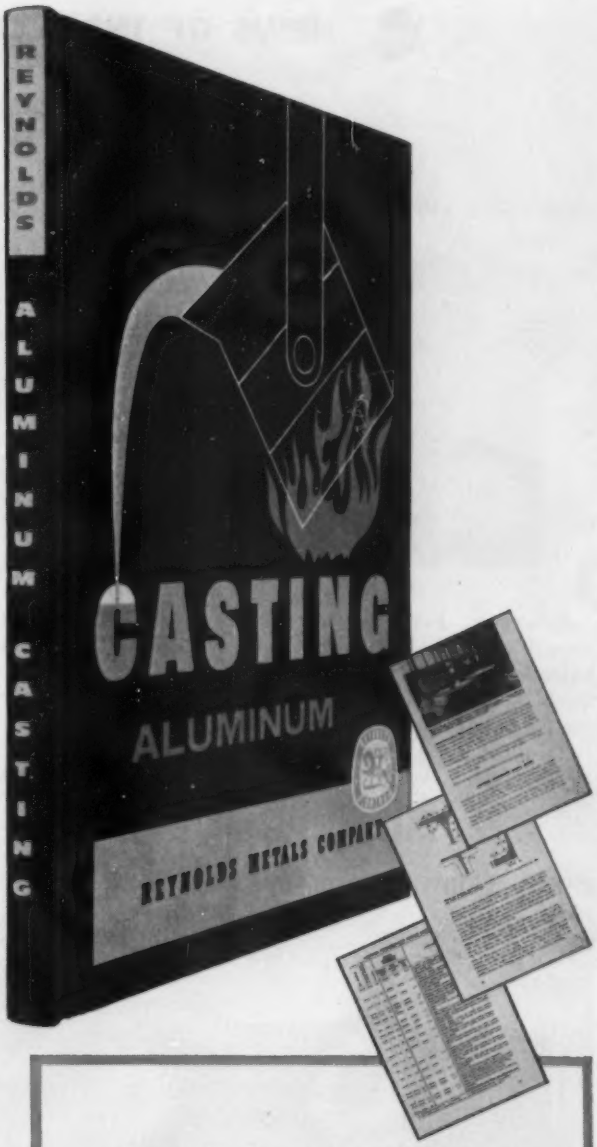
128 PAGES OF FACTS TO ANSWER YOUR QUESTIONS ON CASTING ALUMINUM



Casting Aluminum is a highly informative manual published by the Reynolds Metals Company. It's available—free—to everyone concerned with casting. Hard cloth-cover bound, and profusely illustrated with photographs and diagrams, *Casting Aluminum* is a valuable asset to every technical library.

Get fast delivery on aluminum pig and ingot . . . contact your local Reynolds sales office for the name of the Reynolds Pig and Ingot Distributor in your area.

The amazing growth of aluminum makes understanding aluminum and its potentials doubly important—and this new book can help you realize just how you can do a better job with aluminum.

For your copy of the new Reynolds manual, *Casting Aluminum*, write to *Reynolds Metals Company, Box 2346FP, Richmond 18, Virginia.*

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Effects of Alloying Elements
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Alloy Selection
Aluminum Casting Design
Molding and Coring
Melting, Fluxing and Pouring
Trimming and Cleaning
Heat Treatment
Defects, Quality Control and Salvage

REYNOLDS ALUMINUM

Watch Reynolds new TV show "Harrigan & Son", Fridays, starting October 7; also, "All Star Golf", Saturdays, resuming October 15—ABC-TV. And on Sunday, October 16, be sure to see the exclusive showing of America's new 1961 cars on The National Automobile Show, direct from Detroit over CBS-TV, 6 to 7 P.M. EDST.

Circle No. 60 on Reader Service Card

NEWS OF INDUSTRY & ASSOCIATIONS

activities of people, companies & groups in the precision metal molding industries

FERGUSON APPOINTED

FERGUSON

Robert A. Ferguson has been named manager of marketing at Latrobe Steel Company. He formerly was assistant to the vice president in charge of sales.

Ferguson joined Latrobe in 1952. He has been sales manager of the Special Products Div.

BOLTON & BLUE ELECTED

BOLTON

BLUE

Smith Bolton has been elected President of the Powder Metallurgy Parts Manufacturers Assoc. He succeeds Carl Demrick, formerly of the Amplex Div. of Chrysler.

Roy E. Blue, Chief Product Engineer of the Ampl Division, has been elected President of the American Powder Metallurgy Institute. He succeeds Robert C. Burgess, who had been President since 1959.

PMM APPOINTS EUROPEAN EDITOR

BARTON

PRECISION METAL MOLDING has appointed Hiram K. Barton as European Editor. The appointment permits expanded coverage of European developments in the theory and application of the PMM processes by a recognized authority in the field.

Barton has been in private practice in England as a die casting consultant for twenty years. He writes on theoretical matters, product design, and industry's use of parts made by the PMM processes.

LARGEST HIGH VACUUM CASTING FURNACE EVER BUILT HERE

The largest high vacuum casting furnace ever made in the United States is shown arriving at the new plant of Austenal Division of Howe Sound Corp., Dover, N.J. The furnace was built by the Hull Corporation of Hatboro, Pa.

The furnace will operate at pressures of approximately one micron (0.001 mm Hg). It uses induction heat for melting. The crucible can be charged in several stages while operating under vacuum. Up to twenty ingot molds will be vacuum cast during each cycle.

Alloys poured in this high vacuum furnace will be used on parts such as jet engine turbine blades and rocket motor components.

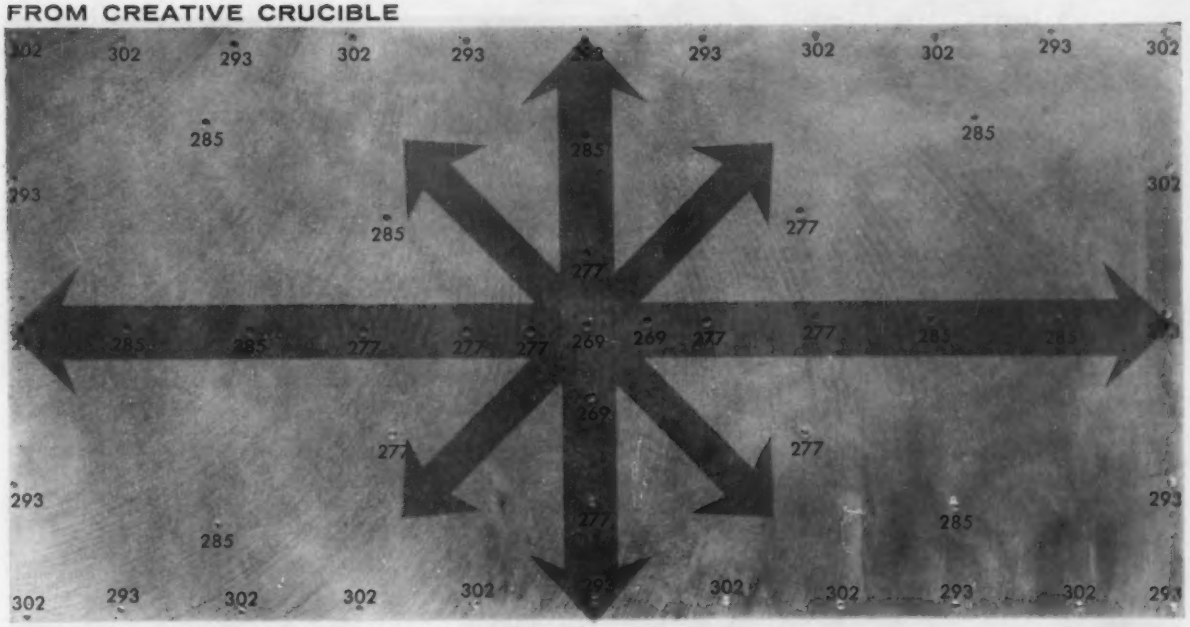
ICI HONORS EUROPEAN

WAINDLE MEERKAMP

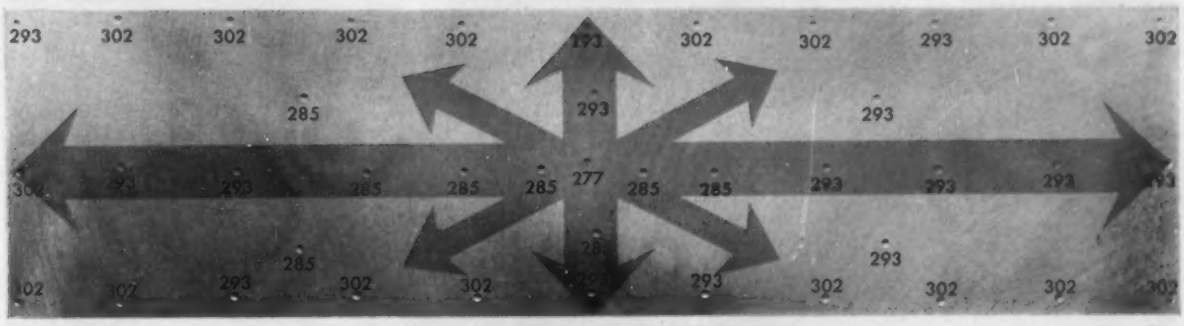
Investment Casting Institute President Roger F. Waindle is shown presenting "The Whale" to I. R. Meerkamp van Embden of the European Investment Casting Assoc. The award signifies Herr Meerkamp's "whale of a job" during his many years of service.

more industry news page 76

FROM CREATIVE CRUCIBLE



20" x 10"



20" x 5"

CSM 2

with positive, high hardenability

Now you can make larger plastic molds and die casting dies—for longer runs—and get better finishes!

Notice the small hardness gradient—across the surface and from surface to center—of these typical blocks of prehardened CSM 2. This small gradient indicates the more uniform hardness of CSM 2—and assures you of at least 5 major benefits:

- more uniform polish from top to bottom of cavity
- greater resistance to washing at center or bottom of cavity
- more positive shut-off surface—particularly in internally landed molds and dies
- more uniform machining characteristics from top to center of cavity
- elimination of heat treatment of most plastic injection molds and zinc die casting dies in sections up to 14" to 15" thick.

Complete details on Crucible CSM 2—either prehardened or annealed—are readily available through local Crucible steel service centers. For data, call the center nearest you or write: *Crucible Steel Company of America, Dept. TI27, Pittsburgh 30, Pa.*

CRUCIBLE STEEL COMPANY OF AMERICA

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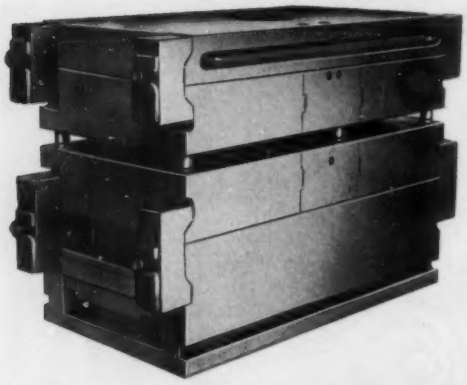
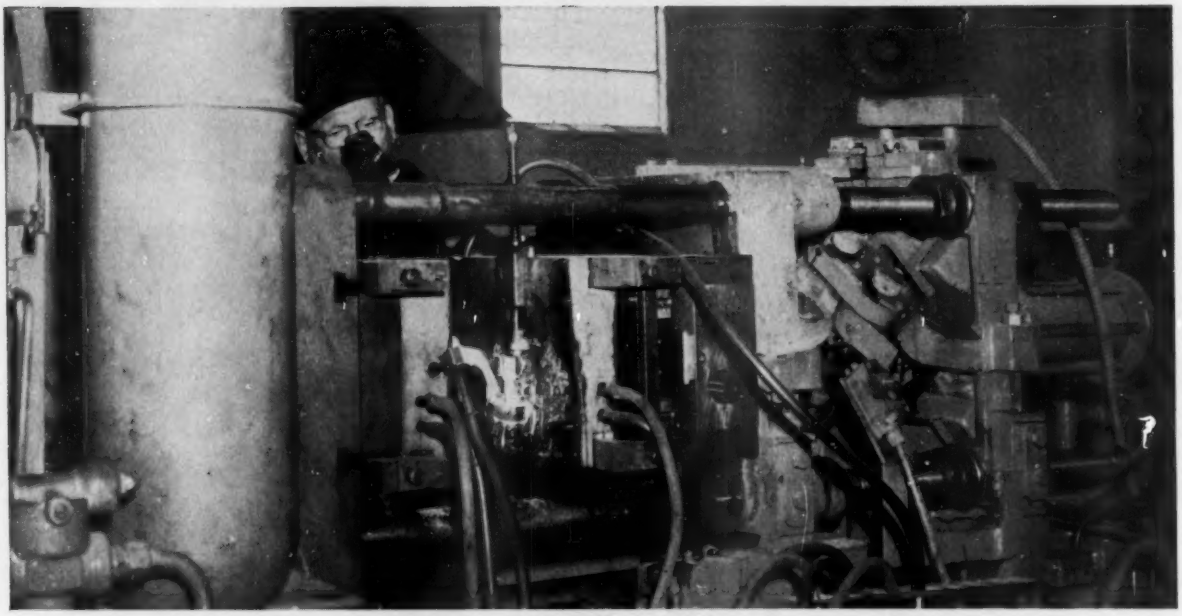


SAVE ON SHORT RUN DIE CASTINGS!

CHANGE DIES IN MINUTES!

With D-M-E Standard Unit Dies for Zinc or Aluminum Die Casting



Cut Die Costs and Save Time with Stock Replacement Units

DIE CHANGES that normally take 3 to 5 hours are done in minutes with D-M-E's Standard Unit Dies for zinc or aluminum die casting.

Standard interchangeable Replacement Units are *in stock* now to reduce your die costs and shorten delivery schedules.

D-M-E's Standard Unit Die assembly offers these unique features for added savings in production time and maintenance:

Construction permits complete freedom on *three sides* of the cavity for placement of cores or cooling lines; six sturdy leader pins and bushings provide accurate alignment and trouble-free performance; and "quick change" wedge clamps for positive positioning of each plate.

Standard Replacement Units are quickly positioned in the Unit Die Holder by a precision T-slot in the mating edge of the plates; there is no interference with the cavity layout.

Whether you require rack and pinion or automatic "bumper-type" ejection, D-M-E has a Standard Unit Die to fit the machine.

D-M-E Unit Die Holders are available for Standard 10″ x 12″ or 12″ x 15″ Replacement Units.

Start saving *now* on your short-run die-casting jobs with D-M-E Standard Unit Dies.

SEVEN BRANCHES FOR FASTER SERVICE

Write **TODAY** for Complete Specifications

DETROIT MOLD ENGINEERING COMPANY

DME

- DETROIT: 6686 E. McNichols Rd.—CHICAGO: 5901 W. Division St. HILLSIDE, N.J.: 1217 Central Ave.—LOS ANGELES: 3700 S. Main St.
- D-M-E CORP., CLEVELAND: 502 Brookpark Rd.—DAYTON: 558 Leo St.
- D-M-E of CANADA, Inc., TORONTO, ONT.: 156 Norseman Ave.

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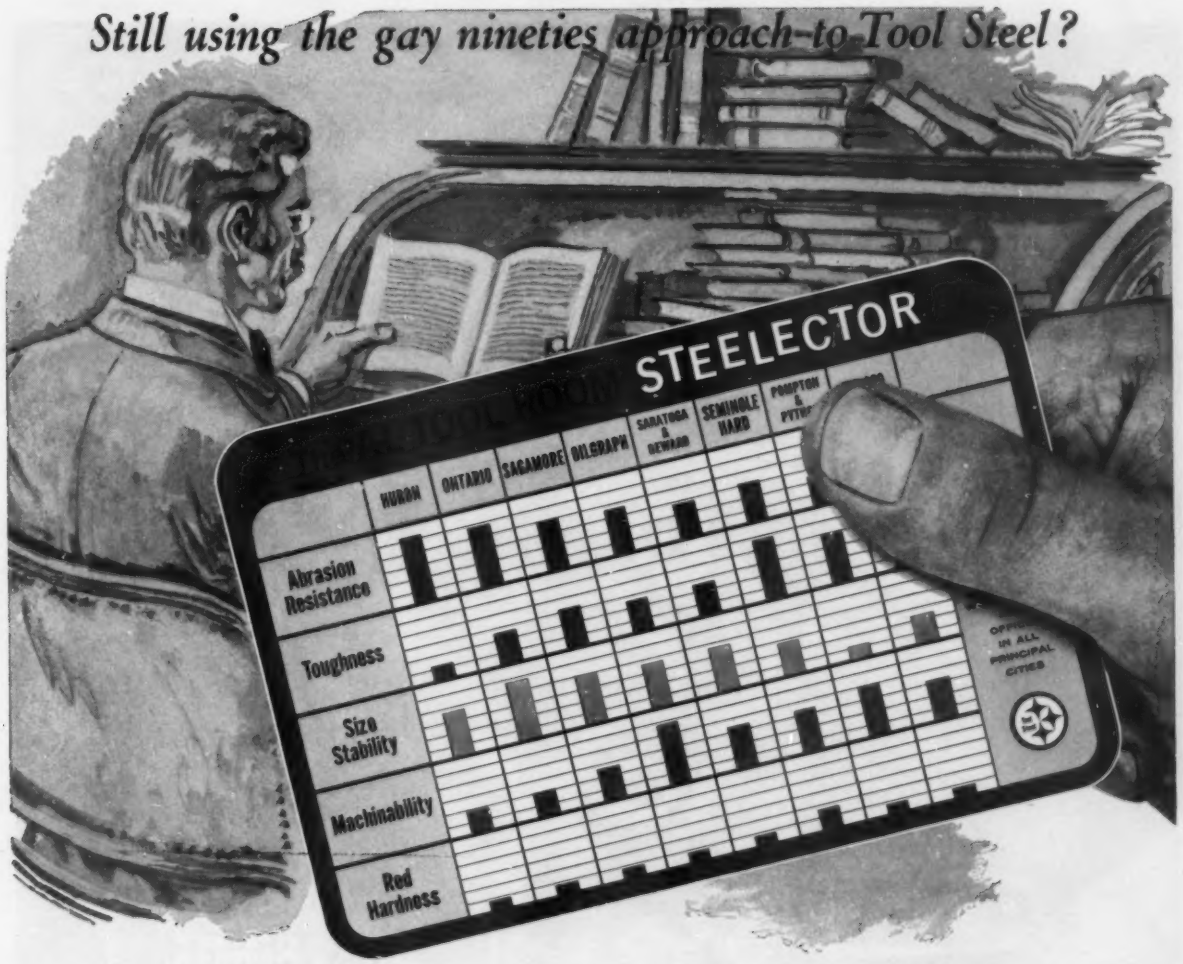
Still using the gay nineties approach to Tool Steel?



Use the New, Modern A-L Steelector System

Now you can accurately select the proper tool steel based on its individual characteristics and be sure that it's available for off-the-shelf delivery before you place your order.

The new Allegheny Ludlum STEELECTOR Program makes tool steel selection fast. And it eliminates the embarrassment of specifying a grade which later turns out to be unavailable or available only after a costly delay.

The leading grades of tool steel that meet 96 percent of all applications—as listed in the Allegheny Ludlum Tool Steel Handbook—form the basis of the STEELECTOR Program. The STEELECTOR Grades are charted on cards covering each group of steels (tool room, hot work, and high speed grades) to help you select the particular grade best for your application.

Bar graphs on each STEELECTOR Card show how the various grades compare in abrasion resistance, toughness, size stability, machinability and red hardness. It's easy to determine accurately the combination of properties that best suits the job at hand.

The complete necessary range of sizes and shapes is listed in a special Data Stock List for every grade. These lists also include heat treating, typical working hardnesses and other data to insure that your selection is correct.

You can choose with confidence because every STEELECTOR grade has been selected from the complete line of Allegheny Ludlum Tool Steel and made under the rigid quality control standards of all A-L products.

For a complete explanation of the STEELECTOR Program, ask your Allegheny Ludlum sales representative for a copy of the colorful A-L Tool Steel STEELECTOR Booklet, or write: *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania. Address Dept. PM-9.*

STEELECTOR PROGRAM

ALLEGHENY LUDLUM

Tool Steel warehouse stocks throughout the country

2069

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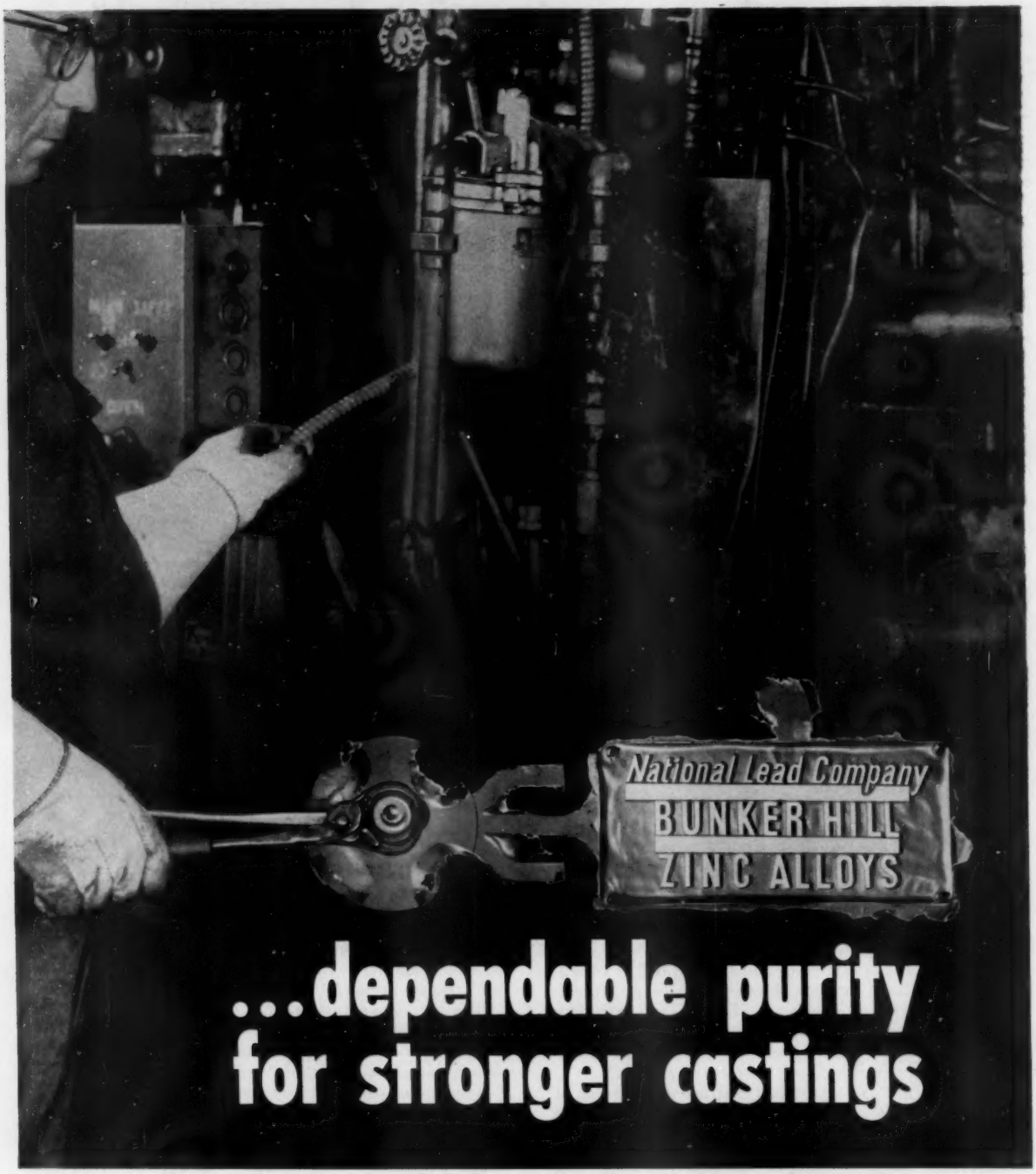

...dependable purity for stronger castings

Purity *beyond* the industry standard... that's what you get with ***National Lead*** Bunker Hill Zinc Alloys.

They more than meet ASTM and SAE specifications for freedom from contaminants. You can expect – and get – sound, uniform, high-strength castings that need very little machining. And, because they're free from porosity, ***National Lead*** Bunker Hill Zinc Alloys trim, punch, tap and broach cleanly... accept plating or other finishing with little or no preparation.

So, for fast, continuous production with a reduced reject count, remember that it pays to start with ***National Lead Company*** Bunker Hill Zinc Alloys – dependably uniform, dependably pure. You'll please your customers *and* your accountants! To order, simply call us.

National Lead Company

General Offices: 111 Broadway
New York 6, N. Y.
Offices in principal cities

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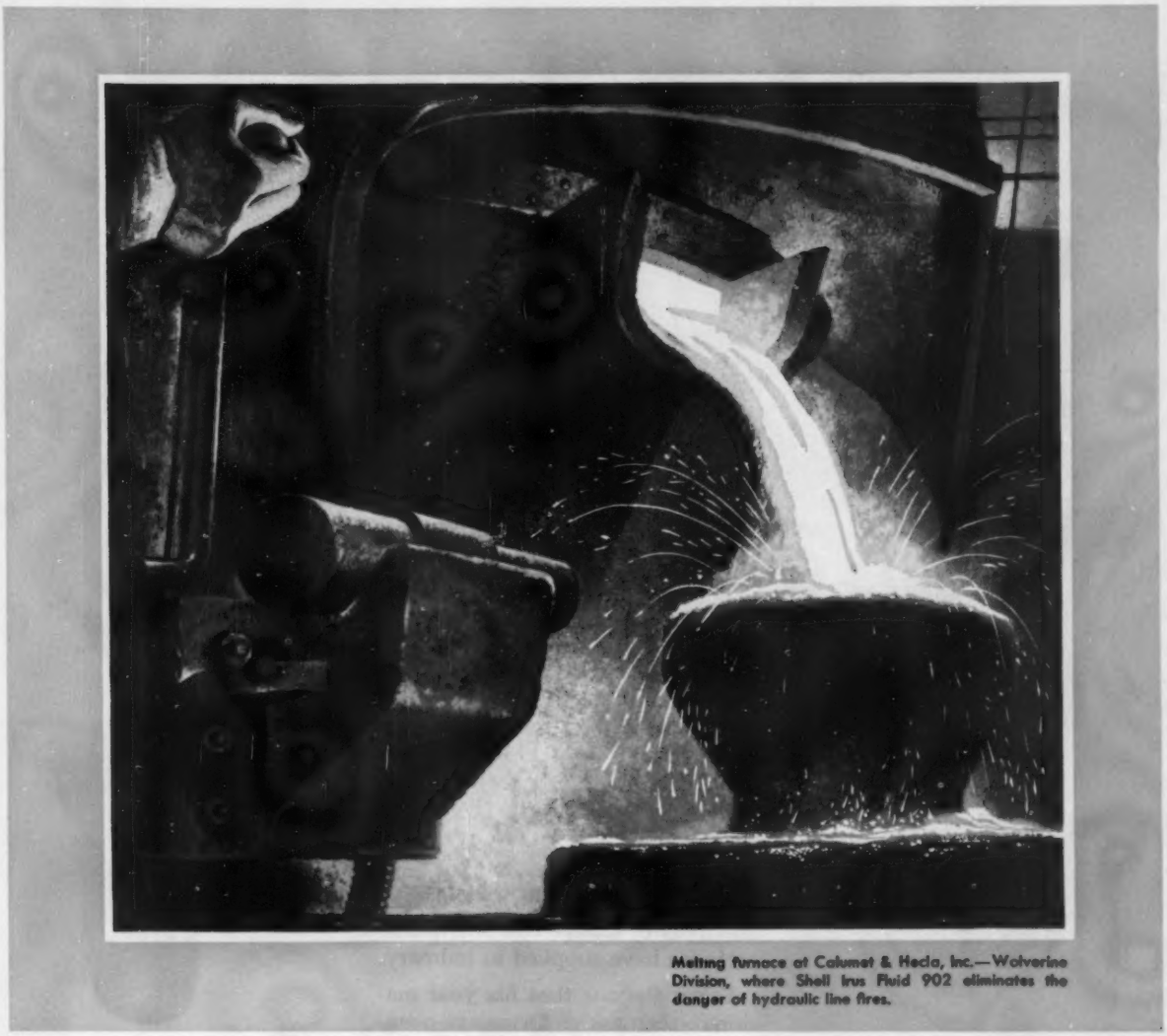


Melting furnace at Calumet & Hecla, Inc.—Wolverine Division, where Shell Irus Fluid 902 eliminates the danger of hydraulic line fires.

Ready... aim... NO FIRE!

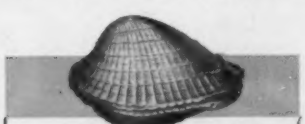
Take 10 high-temperature alloy-melting furnaces, hydraulically operated—each pouring 1500 lbs. of molten metal every hour in close proximity to "live" hydraulic lines—and you can readily see why selection of hydraulic fluids is important to Calumet & Hecla's Wolverine Tube Division.

Now the operation is made more reliable by the use of Shell Irus Fluid 902, a water-in-oil emulsion type fluid. Irus® Fluid was C & H's choice, after carefully studying other commercial hydraulic fluids—for many reasons:

1. Irus Fluid will not support combustion.
2. Irus Fluid has excellent lubricating properties.
3. Irus Fluid has hydraulic efficiency and equipment compatibility.
4. Irus Fluid is economical, costing about one-third less than other fire-resistant fluids.
5. Irus Fluid's bright yellow color makes it easy to spot and trace leaks.

In plant after plant, operators find that these advantages assure maximum safety to both personnel and equipment.

If you have a hydraulic line fire hazard, we suggest that you have the Shell Industrial Products Representative show you the many advantages in Irus Fluid 902; or write to Shell Oil Company, 50 W. 50th St., New York 20, N. Y., or 100 Bush St., San Francisco 6, Calif. In Canada: Shell Oil Company of Canada, Ltd., 505 University Ave., Toronto 2, Ontario.



AN INTERESTING FACT!
Every Shell Branded Industrial Lubricant is named for a sea shell. Shown here is the **Irus** ellipticus.

SHELL IRUS FLUID 902

the low-cost, fire-resistant hydraulic fluid

SHELL

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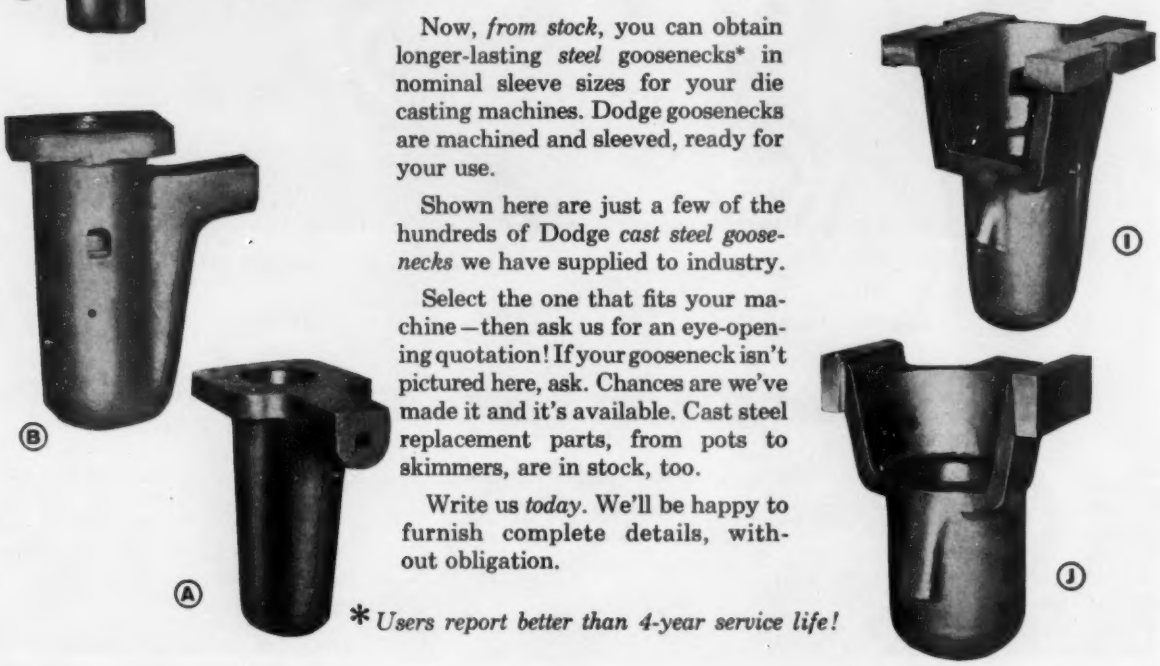
We make them all!

Now, *from stock*, you can obtain longer-lasting *steel* goosenecks* in nominal sleeve sizes for your die casting machines. Dodge goosenecks are machined and sleeved, ready for your use.

Shown here are just a few of the hundreds of Dodge *cast steel goosenecks* we have supplied to industry.

Select the one that fits your machine—then ask us for an eye-opening quotation! If your gooseneck isn't pictured here, ask. Chances are we've made it and it's available. Cast steel replacement parts, from pots to skimmers, are in stock, too.

Write us *today*. We'll be happy to furnish complete details, without obligation.



* *Users report better than 4-year service life!*

DS DODGE PRODUCTS

DODGE STEEL COMPANY

DODGE PRODUCTS DIVISION

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THE MOST IMPORTANT ALLOY IN A STEEL CASTING IS QUALITY

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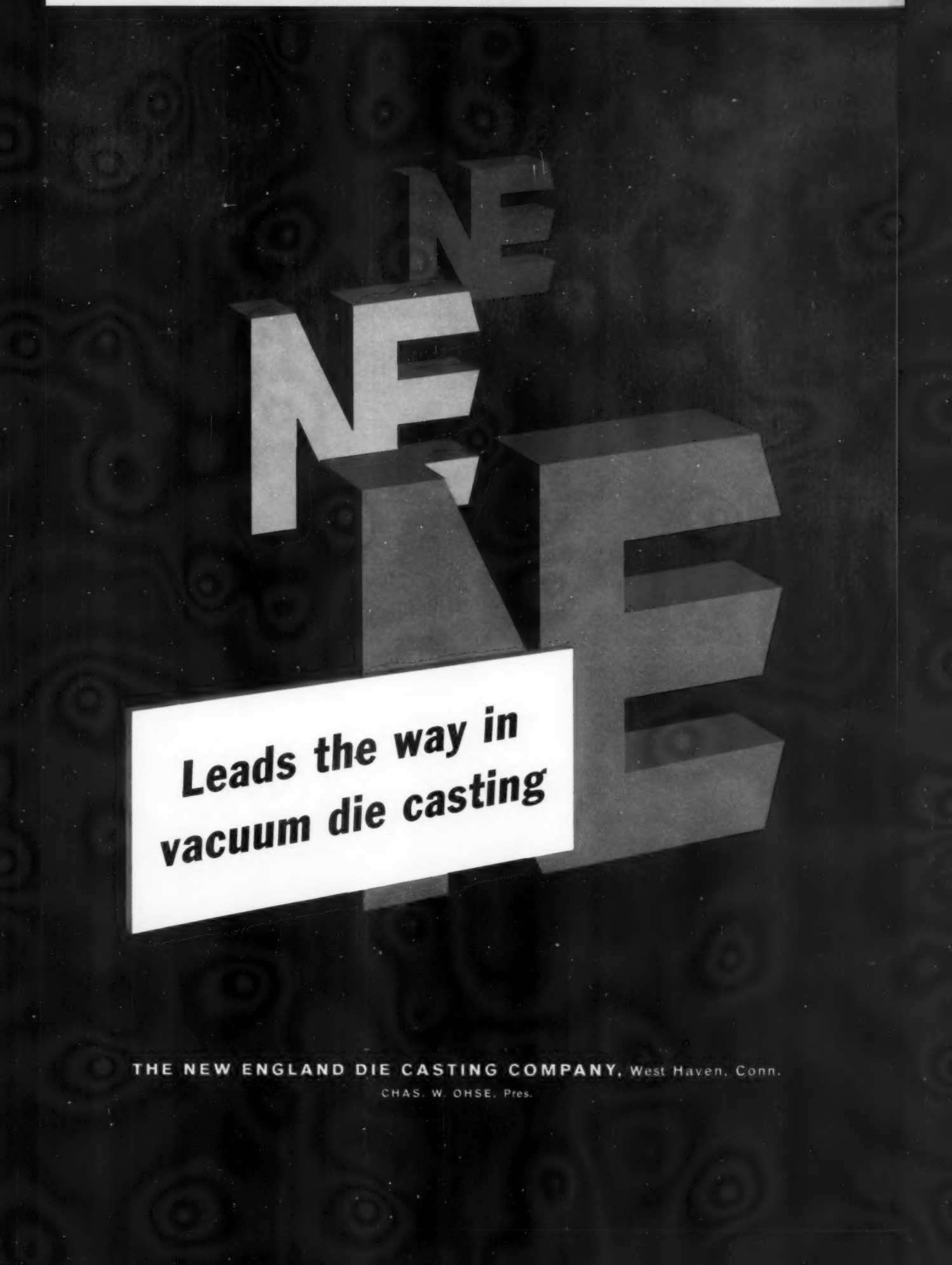


THE NEW ENGLAND DIE CASTING COMPANY, West Haven, Conn.

CHAS. W. OHSE, Pres.

NE
SQUARE FEET
OF MODERN FACILITIES
NEW ENGLAND DIE CASTING COMPANY
445-500 FRONT AVE., WEST HAVEN, CONNECTICUT

DIE CASTING WILL GROW IF...

DURING THE PAST FEW YEARS the die casting industry has had a phenomenal growth. In the period of 1952 to 1959 alone the total tonnage of die castings made jumped over 74%. This growth is even more astonishing when compared with the general industrial growth as shown by Gross National Product. In the same period the GNP rose only 38%, an almost 2 to 1 differential in favor of die casting.

What caused this growth? Mostly increased skilled labor costs, which have gone up about 67% in that same period, and lag in productivity per man hour. These two factors forced manufacturers to hunt for methods which required a minimum amount of direct labor. The most obvious answer was die casting.

Recent labor negotiations and indications of those to come indicate a continued rise in cost of labor over the next several years. This will force a continued use of die castings, but the rate of growth will be lower.

There's been too much complacency among both metal suppliers and die casters. Every time labor got a small increase, a few more jobs fell into the die casters' laps. There really wasn't a lot of selling done.

Competitive materials are making a strong bid for markets which have been exclusively die casting's. Foreign competition is finished products is forcing American manufacturers to drastically reduce or stop their operations.

The die casting industry will continue to grow, but if that growth continues to be by default it won't last much longer.

The die casing industry must face up to the fact that they have to get out and sell their process in fields never before tapped. True, the aluminum industry is doing just that and the results are apparent already. We've an aluminum engine on one domestic automobile now and there's another one coming in 1961, maybe more than one, but one is certain. Die cast aluminum wheels will soon be standard equipment on some cars as will die cast aluminum bumper parts.

But how about other metals. There are markets which zinc die castings can invade if new alloys with superior mechanical properties are developed. These markets are, at present, closed to die castings. The improved finishing systems which have been developed seem, to a large measure, to have solved the most pressing problem of the zinc die casting industry and have let it retain it's historic market of decorative trim. Growth here can only come as fast as the growth of the automobile, appliance, and business machine industries. Nor should the zinc die casting industry overlook the newer plastics. This is an aggressive industry and can become serious competition unless steps are taken to combat it.

Brass die casting is moderately well established and over the years has grown at about the same rate as Gross National Product. Needed in this industry are better die materials which will withstand the high temperatures longer.

Magnesium die castings are the exception to the general increase. Over the past several years there has been a steady decline in their use. Part of this is due to unwarranted fears, part to outmoded safety regulations, and part to high metal prices. Recently, however, metal prices have been quoted which make magnesium die castings much more competitive than ever before. This, coupled with intensive education, is beginning to show results. During the past year, tonnage of magnesium die castings has taken a dramatic turn up. This can continue if the industry continues to educate potential users of this metal.

Certainly the future for the die casting industry can be bright, but there's no room for complacency.

P. R. Kalischer

THE METAL OUTLOOK

NO MATTER HOW YOU LOOK at it, the future for the die castable metals is bright. Except for lead, and we don't know anything about that metal, every die castable metal should register impressive gains in the next few years. There may not be anything spectacular in some cases but healthy growth is certain. Let's take a look at each one.

ALUMINUM

The potential for aluminum die castings is certainly the brightest of any metal. New uses are constantly being developed and older uses expanded.

At present there is one passenger vehicle with an almost all aluminum engine. Even though this engine is largely permanent mold cast it will probably have to go to die casting if production gets up to economical levels. In the opinion of one automobile manufacturer this engine must be partly redesigned and converted to all die castings if manufacturing costs are to be cut to a tolerable level.

Whats' more the 1961 automobile models will have at least one engine line with a die cast aluminum block. Two others are known to be in advanced development stages and one or both may make their bows some time during 1961.

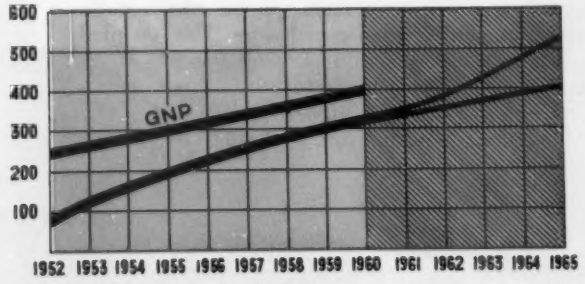
Die cast aluminum bumper ends to match an extruded aluminum bumper are coming. Aluminum wheel, hub, and brake drum units are now here and will become more important.

Why all this conversion in the transportation industry? Simply because the economical limit has been reached in the weight to horsepower ratio with the older more conventional cast iron and steel construction. Now weight has to be cut and the only way to do it is to change to a lighter weight material.

But the transportation industry isn't the only one which will change. Within the next few years the die casting of anodizable aluminum alloys will become a regular procedure. This will open new markets to die castings that have always been out of reach. Home appliances, business machines, toy, and optical and scientific goods are just a few of the fields which will go to color anodized die castings.

So for aluminum the future looks most bright.

(Metal figures, all curves, in millions of pounds. G.N.P. in hundreds of billion dollars.)



ALUMINUM may be headed for its greatest growth period.

BRASS

A tremendous tonnage of small brass castings are now being made as sand castings. The only reason they aren't die cast is the short die life when the brasses are cast.

New developments in tool steel and die materials are certainly promising. Some hot work tool steels are now on the market which are claimed to give ten, twenty, and more times the tool life. Some of the work on molybdenum dies and cores looks as though it will develop good materials for high temperature die casting.

Most of the brass castings now made in large quantities can, with little or no redesign, be made as die castings. When this casting method is teamed with barrel finishing the cost of finished small cast brass parts is going to drop.

MAGNESIUM

About the only thing that holds magnesium back is a bunch of outmoded laws and rules. So-called safety

CHANGE A FEW LAWS and magnesium can expand its usage.

regulations were adopted years ago when little was known about the safe handling of magnesium. Today, this metal can be handled as readily as any other. There's no more danger than is normally found in the handling of molten metals. The repeal or modification of these rules and laws can open many markets to magnesium that are now closed because of the high cost of outmoded safety regulations.

Magnesium has been offered, and apparently can be produced and sold, at prices nearly competitive with primary aluminum. Machining is about the cheapest of any metal, though surface protection does add a small extra cost in some cases.

Certainly this metal has a good potential if some of the superstition about it is cleared away.

ZINC

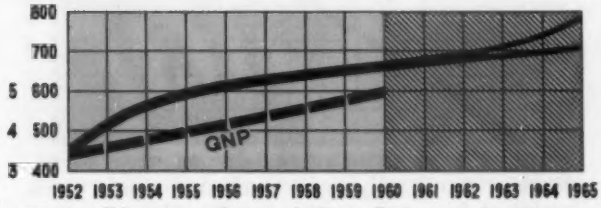
The use of zinc die castings will continue to grow at least as fast as the general economy and probably a lot faster. The new finishing systems which have been developed over the past few years have let zinc regain much of the transportation market it was in danger of losing.

The new alloy development programs are moving along steadily and if the present promise is borne out some of the newer materials which will be developed in the next few years can broaden the market for zinc die castings very considerably.

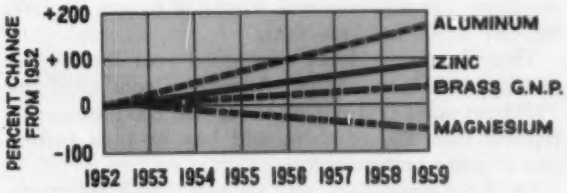
Colorable conversion coatings are under development which may let zinc die castings compete favorably with anodized and dyed aluminum die castings.

Automatic die casting of zinc is now an accomplished fact. Where only a few years ago only very small machines were capable of automatic operation we now have units as large as 400 and 500 tons locking force working on fully automatic cycles. In some plants one operator takes care of as many as five machines. This brings labor costs per casting down to an almost negligible figure. Even when the quantity of parts is not large automatic die casting can be used if the parts can be made in unit dies. According to some die casters the use of unit dies allows die change in as little as five or ten minutes so that machine down time becomes negligible.

So for zinc the future should be growth, possibly even greater growth than has been seen in the immediate past.



ZINC will have a steady growth. New alloys can make it boom.



MOST DIE CASTING metal uses have grown steadily. Aluminum and zinc faster than the G.N.P.

YEAR BY YEAR CONSUMPTION OF DIE CASTING ALLOYS

Percentage Change

Metal	1953 1952	1954 1953	1954 1952	1955 1954	1955 1952	1956 1955	1956 1952	1957 1956	1957 1952	1958 1957	1958 1952	1959 1958	1959 1952
Aluminum	41	–3	36	54	110	6	122	–1	120	–22	72	26	117
Brass	22	–36	–22	31	2	28	21	9	31	–6	23	39	71
Magnesium[1]		–21		23	–3	–17	–20	–16	–33	–22	–47	100	5
Zinc	27	–9	15	55	78	–6	68	–2	65	–24	24	29	60
GNP[2]	5	–1	15	55	78	–6	68	–2	65	0	27	9	38

[1] All figures for magnesium are based on 1953 instead of 1952.
[2] Gross National Product is given as a reference base.
Percentage growth is based on tonnage of metal used by the die casting industry as reported by the Department of Commerce.

THE MARKET FOR DIE CASTING MACHINES

IN SPITE OF an apparently declining market since 1955, the signs last fall all pointed to a sharp increase in die casting machinery business for 1959 and into the '60's. We were sure enough of this turn in business to predict a sale of about 390 machines for last year. Final figures proved this prediction. The minimum actual sales were 383 machines and there may have been from 20 to 30 more machines sold.

There's every indication that this increased rate of machine sales will continue. First half figures for 1960 indicate a 500 machine year.

Theres' more evidence of a good year for the die casting machine builder. A survey conducted by PMM revealed that out of about 600 companies who replied, over 200 of them will buy or plan to buy one or more new machines.

Of these companies who definitely will buy more equipment most of them are jobbing die casters. The actual breakdown showed that 114 jobbing die shops either will buy or have bought new machines during 1960 while only 29 captive shops and 50 shops that do both captive and contract work will buy or have bought new equipment.

This sample is slightly under half of the known shops (there are almost 1500). While projection of such figures is extremely dangerous, the indications certainly point to purchases by more than 400 shops.

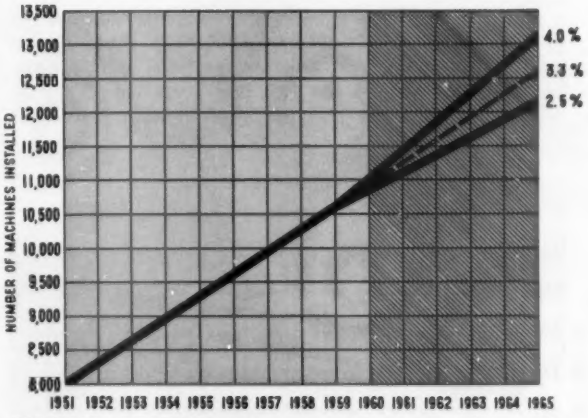
TOTAL MACHINE SALES

(Domestic and foreign, hot and cold chamber)

Locking Pressure Tons	1952	1953	1954	1955	1956	1957	1958	1959	1st half 1960
Under 100	56	65	133	168	206	201	188	141	78
101 - 250	28	32	57	67	50	28	25	51	32
251 - 400	43	70	51	86	55	53	29	86	46
401 - 500	36	49	82	78	37	51	24	24	21
501 - 750	26	50	80	109	85	71	18	31	46
751 - 1000	9	20	0	33	33	35	36	48	19
1501 - 2000	0	0					1	2	3
Total	**198***	**286***	**403**	**541**	**466**	**439**	**331**	**383**	**245**

*Domestic Sales Only; Foreign Sales Not Available

TOTAL SALES OF ALL TYPES OF MACHINES.



NORMAL GROWTH gives an annual 3.3% increase in the number of die casting machines installed. This can increase to 4% in the next 5 years.

It is equally certain that these purchases will not all be single machine orders.

If these survey predictions prove out, 1960 and 1961 should be banner years for the machine builders. This year, 1960, should come close to 500 units and next year should be even better.

Over the past years the average rate of rise for the die casting industry has been about 3.3% per year. Even when the very bad years are given equal weight with the average ones the rise has been at the rate of 2.5% per year. These figures are based on the known number of machines installed.

At the beginning of 1960 there were some 10,600 die casting machines installed in 1482 establishments. Projecting backwards on known sales this gives a figure of 8000 machines installed in 1951. Now if this average rate of increase were to continue to 1965 there will be 12650 machines installed and operating. This assumes that the number of companies entering and leaving the field remains constant.

However, if the trend of the past three years were to continue the rate of increase would fall to 2.5% per year with only 12200 machines then in operation.

But as we have shown, the downward trend has stopped and sales are rising. If the rise continues through 1965 then the average rate of change will

be 4.0% per year and by the end of 1965 there will be 13150 machines in operation.

All of this assumes that there will be no change in the number of plants doing die casting. Over the past years this has not been true. We believe that the industry will continue to grow as it has in the past so that the predicted rate of growth of 4.0% per year may be on the conservative side.

Our survey gave some indications of the size of machines that will be purchased in the near future. Only 182 plants gave this information, but their replies show a preponderance in the range of 101 tons locking pressure to 400 tons locking pressure. Actual figures for this group are:

Capacity in tons	No. of machines to be added
100	22
101–250	48
251–400	41
401–500	27
501–750	47
751–1000	16
1001–1500	8

Of the total of 209 machines listed in this table, 25 will be bought by captive plants, 54 by plants who do both jobbing and captive work, and the balance, or 130 machines, by jobbing shops.

A growing concern of the die casting machinery builders has been the number of machines which are home-made. Actually the percentage is very small. Out of 466 plants who reported on this point, about 92% buy their machines.

Else wherein this forecast we give the statistics for the number of vacuum equipped die casting machines. While most of these installations are all, or in part, home made it is interesting to note that the machine builders are furnished an ever increasing number of vacuum equipped units. In 1959 the total number reported was one hot chamber machine and 4 cold chamber machines. In the first six months of 1960, three vacuum equipped hot chamber machines and 17 cold chamber machines were sold.

While the total number of vacuum equipped machines sold was not great, the change in about 1½ years is quite impressive.

Many of the captive shops which have grown up during the past several years have been in the automotive field. This would seem to indicate that work in the jobbing shops would fall off. Based on the known shops that are going to buy new equipment this is obviously not true. Our survey showed not only that most of the machines would be bought by known jobbing shops, but further it showed that most of the machines would go into shops well removed from the heavy automotive centers.

Based on the answers received, the known purchases will be in these following locations.

State	No. of companies buying	State	No. of companies buying
Arkansas	1	Missouri	3
Calif.	32	Nebraska	1
Canada	6	New Jersey	12
Conn.	7	New York	22
Georgia	1	N. Carolina	3
Illinois	18	Ohio	16
Indiana	8	Oregon	2
Iowa	4	Penna.	12
Maryland	2	R. I.	1
Mass.	4	Tenn.	3
Mich.	16	Texas	5
Minn.	6	Wisconsin	8

DOMESTIC MACHINE SALES

HOT CHAMBER

Locking Pressure Tons	1952	1953	1954	1955	1956	1957	1958	1959	1st half 1960
Under 100	52	64	73	83	111	129	138	109	60
101 - 250	16	16	15	39	32	8	15	35	15
251 - 400	5	27	8	32	23	17	19	44	21
401 - 500	19	22	41	49	22	27	12	12	8
501 - 750	5	20	20	43	12	3	6	11	14
751 - 1000	4	4	0	10	20	1	3	17	7
Total	**101**	**153**	**157**	**256**	**220**	**185**	**193**	**228**	**125**
COLD CHAMBER									
Under 100	4	1	4	8	14	13	12	5	5
101 - 250	12	16	19	13	14	9	6	10	11
251 - 400	38	43	28	39	28	30	9	33	17
401 - 500	17	27	37	29	12	24	22	12	11
501 - 750	21	30	57	62	73	66	11	20	32
751 - 1000	5	16	0	22	11	33	29	29	11
1501 - 2000							1	2	3
Total	**97**	**133**	**145**	**173**	**152**	**175**	**90**	**111**	**90**
All Domestic Sales	**198**	**286**	**302**	**429**	**372**	**360**	**283**	**339**	**215**

TOTAL DOMESTIC SALES, BY MACHINE TYPE.

FOREIGN MACHINE SALES

HOT CHAMBER

Locking Pressure Tons	1952	1953	1954	1955	1956	1957	1958	1959	1st half 1960
Under 100			45	65	73	52	33	24	12
101 - 250			12	5	0	3	2	3	2
251 - 400			5	0	3	5	1	6	2
401 - 500			2	0	2	0	0		
501 - 750			0	0	0	0	0		
751 - 1000			0	0	0	0	1	1	
Total			**64**	**70**	**78**	**60**	**37**	**34**	**16**
COLD CHAMBER									
Under 100			11	12	8	7	5	3	1
101 - 250			11	10	4	8	22	3	4
251 - 400			10	15	1	1	0	3	6
401 - 500			2	0	1	0	0		2
501 - 750			3	4	0	2	1		
751 - 1000			0	1	2	1	3		
Total			**37**	**42**	**16**	**19**	**11**	**1**	**1**
All Foreign Sales			**101**	**112**	**94**	**79**	**48**	**10**	**14**

TOTAL FOREIGN SALES, BY MACHINE TYPE.

PROGRESS IN RESEARCH

Work now in progress promises to open new fields of application for die castings.

ALLOY RESEARCH

RESEARCH, PARTICULARLY IN ZINC, is starting to show some promise in the development of entirely new alloy systems. Present indications are that some of the die castable alloys which may come from this work will have mechanical properties far in excess of any properties of zinc alloys which have been available.

Results thus far indicate that the 8% aluminum alloy and the 14% aluminum alloy have the most desirable properties in the simple binary alloy.

Thus far, studies of the ternary alloys have been made on the 8% aluminum binary alloy only. Some of the results are:

- **Antimony** — When added in amounts up to 0.15%, is an undesirable additive. It appears to lower impact properties and resistance to intergranular corrosion.
- **Cobalt** — Only traces of cobalt are retained in the cast alloy. There appears to be no change in mechanical properties, but does reduce expansion in steam and intergranular corrosion.
- **Nickel** — Nickel has about the same effect as cobalt.
- **Silicon** — In amounts up to 0.40% added with only 0.11% retained in the casting, silicon improves the resistance to steam, but lowers the impact resistance.
- **Titanium** — Much the same effect was noted with titanium as with nickel and cobalt.
- **Iron** — There appears to be no beneficial effect from iron, but it can be tolerated as a minor impurity.
- **Manganese** — Like iron, manganese tends to take some of the aluminum out of solution in the melt. Manganese produced a small, but significant, improvement in strength and hardness. It also decreases the tendency toward intergranular corrosion.
- **Copper** — In amounts up to 12%, copper showed a substantial increase in strength and hardness, but no change in creep resistance. Ductility was lowered. Aging increased the loss of ductility and showed a dimensional growth.
- **Chromium** — Only 0.016% of chromium is retained in the castings, but this small amount has a large effect. Tensile strength and hardness were increased without appreciable loss in ductility and toughness. Most significant is the almost complete elimination of intergranular corrosion.
- **Vanadium** — Up to 0.05% of vanadium was added to the basic zinc aluminum alloy. This element seems to be the only one tried, so far, which is soluble in the binary alloy in amounts greater than those added. The effect of vanadium is very similar to chromium.

PLATING RESEARCH

An active program is continuing on the finishing of zinc base die castings. Thus far, the duplex nickel system seems to give the best results. This is particularly true when the duplex nickel is combined with a crack-free chromium.

When either 0.8 or 1.2 mils of duplex nickel are applied under crack free chromium there is little or no corrosion blistering after 8 cycles of Corrodkote or 144 hours of CASS testings. The same results were found when duplex nickel was under 0.055 mils of bright, crack-free chromium.

Apparently the semibright to bright nickel in the duplex layer should be a 75:25 ratio. When the ratio was dropped to 55:45 the corrosion resistance was not as good.

When only bright nickel is used, there is some improvement if bright chromium less than 0.1 mil is substituted for 0.3 or 0.4 mil of copper undercoat.

Thermal cycling tests between 70°F and 175°F to simulate day to night heating and cooling are being carried on. So far, the evidence indicates that relatively thick crack-free chromium on complex commercial shapes stands up better than other coatings.

On tests to determine the effect of gravel bombardment, duplex chromium seems to hold up the best. This is especially true when the plated layer is copper, duplex nickel, and crack free chromium.

The lowering of the impact strength of zinc base die castings when plated with the conventional copper, nickel, chromium system is fairly well known. When the bright chromium is replaced with duplex chromium there is either no reduction, when the chromium is about 0.05 mil thick, or an increase in impact strength when the chromium is only about 0.01 mil thick.

It is believed that the brittleness of the bright nickel is responsible for the decrease in impact strength.

VACUUM DIE CASTING

Development work in vacuum die casting continues. Most recent work has aimed at the vacuum die casting of aluminum. Several systems are now in use which permit fully automatic operation of cold chamber machines.

These developments have led to the casting of several aluminum alloys which are normally too sluggish to be die cast. These alloys are, mostly, those which can be anodized most readily. (See report on finishing in this issue, page 50.)

THE MARKET FOR DIE CASTINGS

IT'S THE MAN AT THE DRAWING BOARD who will determine the future of the die casting industry. How well he anticipates or molds consumer tastes can have a tremendous impact on the entire die casting industry.

Forecasting, therefore, becomes much more difficult than is the case in some other industries. But the past is still a good indication of the short term future. When the past is coupled with known new developments it's fairly safe to do predicting for a short period.

Based on these known factors the following five year trend in the use of die castings has been made for twelve industry groups. The industry breakdown used by the American Die Casting Institute has been used as has been this Institute's estimate of pounds of metal cast by the jobbing die casters.

For each industry, the consumption of zinc and aluminum only has been shown since these are the major metals cast. In addition, the Gross National Product has been shown as a reference base. In all cases the consumption of metal is in millions of pounds and the GNP in either billions or hundreds of billions of dollars. Actual consumption for any given year can not be read from these curves since they are intended to give trends only. The pounds of metal given will only serve as a frame of reference.

In almost all cases the trends for the next five years are shown as continuations of the 1952 to 1959 rate of change. Whether this will probably continue and what factors can change it is discussed under each industry group.

For the die casting industry as a whole, the next five years should be good. In most cases the use of die cast components may be expected to grow more rapidly than in the past. All indications point to a faster change in the rate of growth for aluminum than for zinc. Magnesium has to wait for changes in rules and regulations governing safety before it can expand very much. Brass needs new die materials to let it expand as it should. With these generalities let's look at the individual industry trends. (Trend curves are shown on pages 42 and 43.)

AGRICULTURE & CONSTRUCTION

This industry has shown such wide swings and is so dependent on such factors as weather, government action, and the rice yield in Formosa that any prediction for the future would be meaningless. In the past, there has been a shift from zinc to aluminum die castings. This will probably continue. While the total market is small (about 6 million pounds of zinc and 12 million pounds of aluminum in 1959) it is capable of extensive growth. The development of higher strength die castable alloys could increase this market materially. For the most part, the number of duplicate parts used is small. This is one of the factors which limits the greater use of die castings. Iron sand castings are a favored material, but they can be replaced.

AUTOMOTIVE (Motor Vehicles)

Here is the industries most important customer. Up to the present time the use of zinc die castings has been well ahead of aluminum. Both metals have advanced faster than average economic growth of the country. They will probably continue to do so. The curves given for this industry are somewhat in error since the captive establishment in this field is of prime importance. It is probable that the rate of growth for aluminum is much greater than is shown. New developments in the automotive field will increase this rate of growth even faster in the next few years.

Zinc can be expected to continue its growth at about the same rate. There may be some improvement if new, high-strength alloys are developed. It is important to note that in spite of the expected surge in aluminum applications there is no indication that they will be at the expense of zinc. About the only change from zinc to aluminum which might come is if color anodizing of aluminum die castings becomes economically feasible. This should make only a slight impact on zinc.

TRANSPORTATION (Non-automotive)

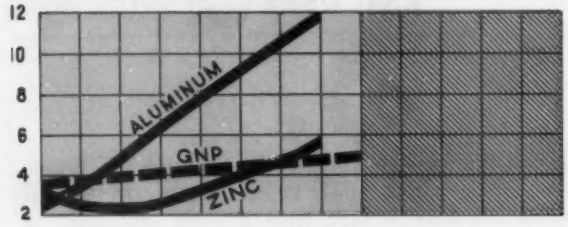
Non-automotive uses of die castings have been rather limited in the past. Zinc die castings have been used to a very limited extent and mostly for non-functional parts such as housings and minor supports. There is no indication of any spectacular gains in the immediate future.

Aluminum will probably show some spectacular gains in this field. As the uses of aluminum extrusions, sheets and plate expand, the applications of die castings will have to expand with them. In general, the aluminum industry feels that within the next five to ten years the transportation industry in general will become the largest single industry customer for aluminum. If this proves out the die casting industry will get its share.

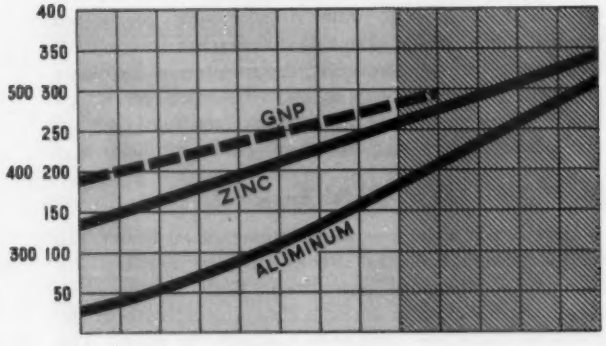
MACHINERY & TOOLS

This is the third largest industry classification in the use of die castings. It is a highly diverse group

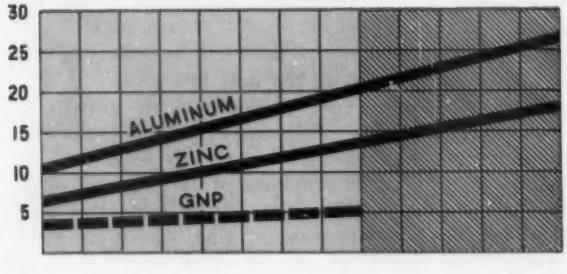
AGRICULTURE & CONSTRUCTION



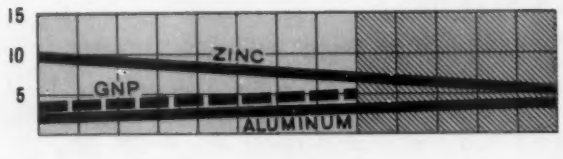
AUTOMOTIVE



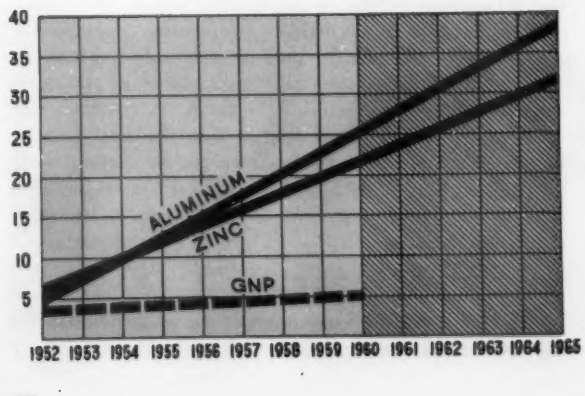
MACHINERY & TOOLS



ELECTRONIC DEVICES



BUSINESS MACHINES



ranging from large, complex industrial machine tools to the small hand tools for home workshops.

Many of the products in this class are made in very large amounts so that the use of die castings has become an economic necessity.

Light weight is an important factor and explains why the tonnage consumption of aluminum is above that of zinc. Certain plastics made a strong bid for this market. Most of them failed due to lack of impact strength.

While the machine tool market is not as good as it should be due to imports of foreign made machines, this segment is of minor importance to the die caster. The small, low priced tools and machines are the major customer here. The market will continue to rise at a good steady pace for the next several years. However, the danger of competition from plastics grows greater all of the time and the die caster may have to fight to retain this industry group as such a large segment of his business.

ELECTRONIC DEVICES

One of the smallest markets for die casting, this industry group offers the least potential for growth.

Zinc has been losing its market rather steadily and will probably continue to do so. This is probably due to the trend to very light weight miniature components. In those cases where fractions of an ounce of weight are important every change to lighter components that is possible is made.

Even with the advantage given by weight, aluminum will probably never have a large die casting market in this field. While it will grow, the number of duplicate parts required is generally so small that die casting is generally not economical. This is probably the poorest growth market for the industry.

OFFICE & BUSINESS MACHINES

Here's one of the brightest pictures for the die caster. This industry group has always been and will continue to be a good customer.

Both zinc and aluminum will enjoy high gains during the next few years. The rapid emergence of all sorts of sorting and computing machines will be an important factor in this growth.

While plastics have had some effect on this market, there is little danger that they will become important. This is particularly true if anodizable die castings get low cost enough.

Vacuum die casting of small, highly intricate parts is another factor which is helping this market to expand. Probably the actual rate of expansion will be greater than the projected curve shown.

PLUMBING, HEATING & HARDWARE

Traditionally a stronghold of die casting this market is almost entirely tied to the building rate.

During the past year or two, the number of housing starts has been down. Commercial building has been strong which has helped maintain this market.

The coming years should see a market increase in

housing starts and industrial buildings. The commercial building field may slow down.

With the strong promotion for more widespread use of aluminum in buildings there is bound to be a wider use of aluminum die castings.

The growth curves shown are probably low, especially for aluminum.

Should suitable die materials be developed there will probably be a very great surge in the use of brass die castings. This field now represents 68% of all the brass die cast. It could easily become much larger, probably doubling its present useage of 5 million pounds in 1959.

PHOTOGRAPHIC & OPTICAL DEVICES

The rate of growth in this field for both zinc and aluminum has been steady and will continue to be. There are no indications that either metal will show any marked change in rate in the immediate future.

The invasion of plastics into this field probably will not increase.

Some of the most intricately contoured die cast parts are used in these products. The wider use of vacuum die casting can help to expand this market. It is doubtful if color anodizing will have much effect in this industrial group.

TIMING & TIME OPERATED DEVICES

All indications point to continued growth of this industry group at about the same rate as the GNP. There appears to be no reason to hope for any marked departures from this slow rate.

HOME APPLIANCES

This, the second largest consumer of die castings, can be an explosive market. Styling changes are most important as are the number of residential housing starts. The trend in the last few years to include many of the major appliances as built-in features of new homes has done much to stimulate this market. If the upswing in housing starts is realized this industry group will show the effect. Weather is another important factor plus the fact that air-conditioning is not yet built-in can have a depressing effect.

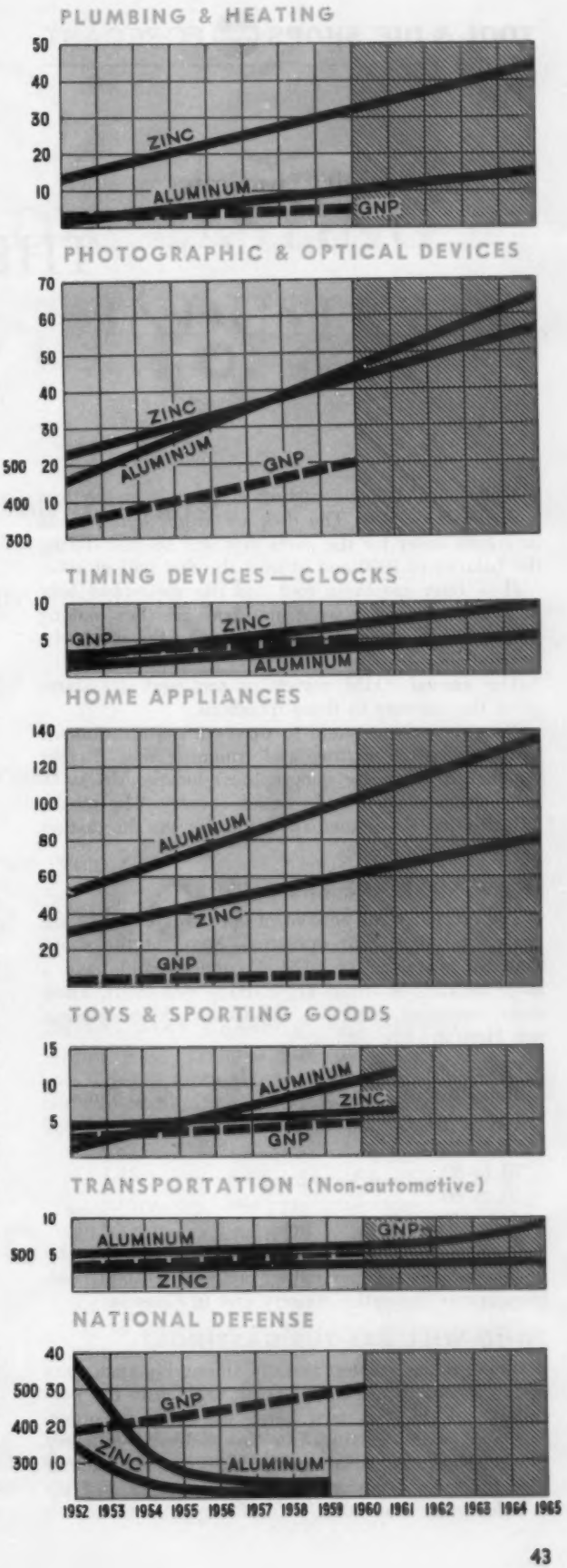
Color will also play an important part and may give aluminum a faster than normal upward trend.

The fact that the high war-time birth rate is now reflected in young married couples will help to keep the sales of small appliances up.

The trend curves shown are probably minimum rates for this industry. They could well steepen.

TOYS, SPORTING GOODS, JEWELRY

Zinc die castings are the basic metal of this industry. It will probably continue to be. Plastics have made and will continue to make strong inroads into a market traditionally belonging to metals. Where gains greater than the normal trend are made, they will probably be made by aluminum. Weight is the important factor here. Trends beyond the very immediate future are almost impossible to predict.



Tooling activity indicates . .

THE DIE CASTERS WILL BE BUSY

NEXT YEAR'S die casting activity is in the tool and die shops now. The dies are either being made or are on order for the parts that will be cast during the balance of 1960 and at least the first half of 1961.

How busy are these tool and die shops and how is their backlog. For what industries are they making dies and how does the future look to the men who run the shops.

The annual PMM survey of tool and die shops gives the answers to these questions.

No attempt was made to survey all establishments which make die casting and trimming dies. Rather we picked shops by geographical location so as to get a cross-section of the entire country. The results indicate that the immediate future for the die casting industry is promising.

HOW BUSY ARE THE SHOPS?

The estimates for percent of operating capacity are based on single shift operation. Some of the shops that are operating at 100% of capacity and have a large backlog of orders are running two shifts. Their major comment, however, was lack of skilled personnel. Here are the results.

Operating Rate, %	% of Shops
100	35.7
90 to 99	28.6
70 to 89	16.1
50 to 69	14.3
under 50	5.3

From the results of the survey there seems to be no vacuum as the percentage activity is about uniform across the entire country and in Canada.

WHO WILL USE THE CASTINGS?

Where is the greatest activity among the customers of the die casters. The following table lists the percentage of the dies now being made, or on order, that will make castings for the different industry groups. Naturally, since most of the shops are making dies for several customers the percentages add up to a lot more than 100.

End use	% of Shops
Automotive	64.2
Other Transportation	16.1
Farm Machinery	8.9
Business Machines	37.5
Home Appliances	73.2
General Industrial	35.7
Consumer Goods	30.4
Optical & Scientific	14.3
Unknown	30.4

While the automobile industry is known to be the largest single consumer of die castings, the production of dies for that industry is largely completed by this time.

However, the high percentage of shops making dies for the home appliance industry indicates fairly widespread design changes in this industry so that activity for the die casting shops should be high. This is particularly significant for the jobbing die caster since the appliance industry has fewer captive shops than any other single industry which uses large numbers of die castings.

HOW IS THE BACKLOG?

Die casting activity for the longer pull is fairly well indicated by the backlog of orders for dies. Any significant lowering of backlog would indicate some lean months ahead. Here is how things look now.

Higher than last year	33.5% of shops
Same as last year	38.8% of shops
Lower than last year	27.7% of shops

WHAT THE INDUSTRY THINKS?

Finally, how does business look to the owners of these tool and die shops in the foreseeable future.

Better	39.6%
The Same	50.9%
Poorer	9.5%

Obviously those men are pretty optimistic about the future of the die casting industry.

THIS IS THE DIE CASTING INDUSTRY

By P. R. KALISCHER, *Editor*

HOW BIG **is this die casting industry of ours?**

HOW MANY **casting machines are installed?**

WHERE **are the machines located?**

ARE THEY **mostly hot or cold chamber?**

HOW MUCH **die steel is used per year?**

These are the questions which come to PRECISION METAL MOLDING day after day. We set out to get the answers to these and many other questions about the industry. Questionnaires were sent to almost 1500 known die casting installations in the United States and Canada. More than 500 replied. We've tabulated the results of these replies and then projected the results to the entire industry. This projection is safe since the answers represented a good cross section in size, number, and location. Here are some of the things we found out.

HOW MANY MACHINES ARE INSTALLED

According to our replies the average die casting shop has 7.15 machines of all types. These are divided into 4.05 hot chamber machines per plant and 3.10 cold chamber machines per plant. These averages projected over 1482 installations showed:

Total Machines Installed	10,596
Hot Chamber machines	6,002
Cold Chamber machines	4,594

WHAT SIZE ARE THE MACHINES?

Most of the people told us how big their machines are. Using a locking pressure break-down which is fairly common in the industry we came up with these figures:

Size tons	Hot Chamber	Cold Chamber	Total
under 100	1731	230	1961
101 to 250	1478	492	1970
251 to 400	1305	1098	2403
401 to 500	916	1240	2156
501 to 750	363	1099	1462
751 to 1000	177	348	525
1001 to 1500	16	68	84
over 1500	12	19	31
Totals	5998	4594	10592

(note: Totals do not exactly agree with the projected figure for the industry because of slight variations in reporting.)

continued on page 48

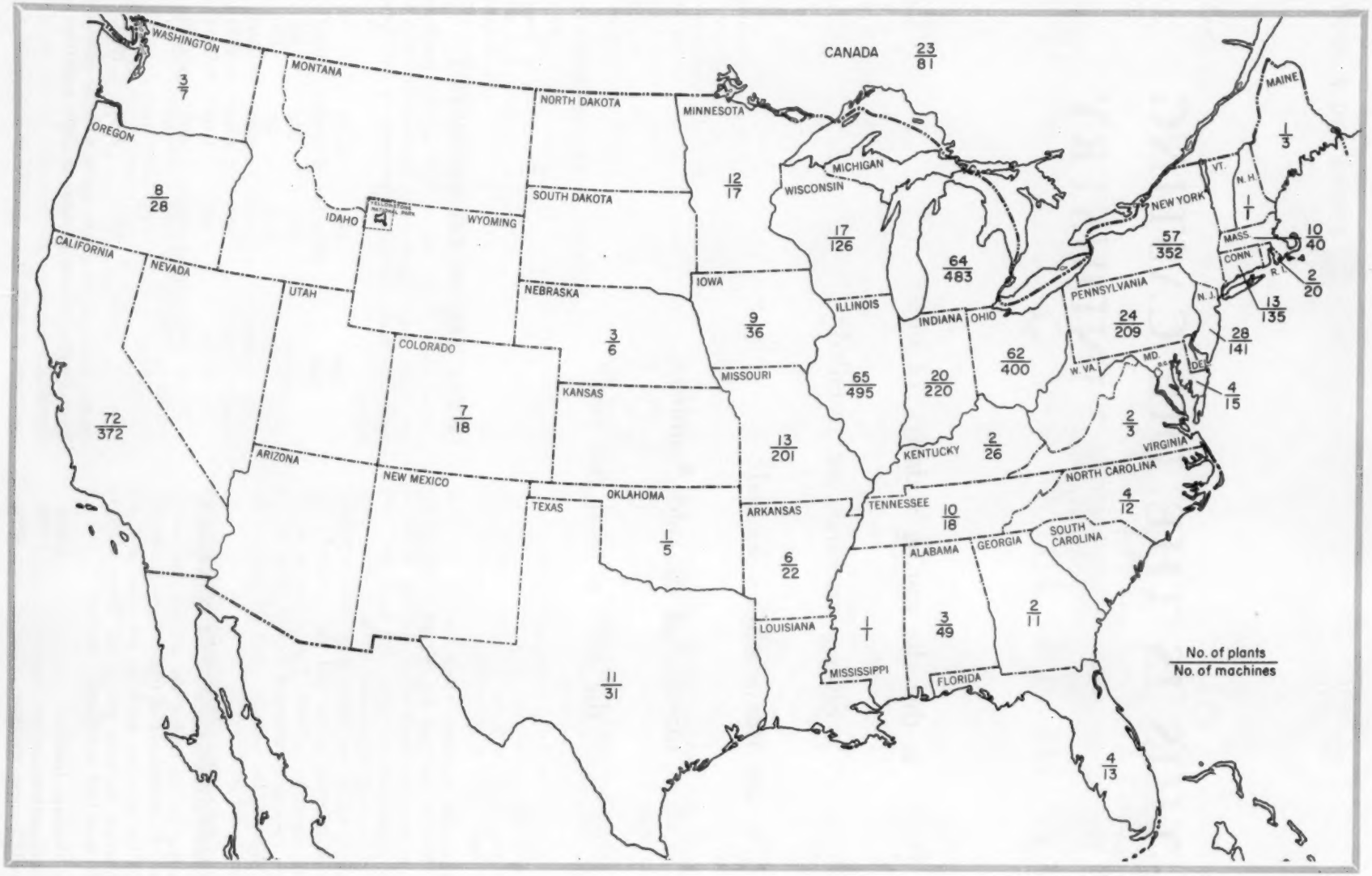


FIG. 1 DISTRIBUTION of die casting plants and machines in the United States.

TABLE I

DISTRIBUTION OF DIE CASTING INDUSTRY IN THE UNITED STATES

STATE	Number of Establishments (1) Con.	Cap.	Both	Total	Age of Establishments (2) Oldest	Newest	No. Mach. (3)	Type of Machines (4) Hot	Cold	Vac	Years in Die Casting (5) 5	5-10	11-15	16-20	20
Alabama	1	1	1	3	4	2	49	2	47	0	3				
Arkansas	3	2	1	6	9	1	22	4	18	0	2	2			
California	35	17	20	72	30	1	372	182	190	4	10	24	23	5	10
Canada	10	0	13	23	18	3	81	57	24	2	2	8	11	1	
Colorado	2	4	1	7	15	5	18	15	3	3		1	5		
Connecticut	9	2	2	13	53	2	135	75	60	37	3	5	1	2	2
Florida	2	1	1	4	11	2	13	8	5	0	1	2	1		
Georgia	1	1	0	2	14	1	11	3	8	0	1		1		
Illinois	36	15	14	65	53	1½	495	231	264	12	6	18	10	3	13
Indiana	9	6	5	20	35	1	220	125	95	24	2	5	4	2	4
Iowa	5	2	2	9	23	1	36	19	17	7	3	3	1	1	1
Kentucky	1	1	0	2	3½	3	26	5	21	8	2				
Maine	1	0	0	1	12	-	3	2	1	0			1		
Maryland	1	3	0	4	25	4	15	8	7	0	1	1	1		1
Massachusetts	6	2	2	10	30	9	40	23	17	0		3	3		1
Michigan	44	8	12	64	35	3	483	320	163	37	7	23	17	2	5
Minnesota	2	5	5	12	19	3	37	17	20	1	2	4	2	1	1
Mississippi	0	0	1	1	5	-	1	1	0	0		1			
Missouri	6	6	1	13	30	6	201	87	114	22		1	6	3	3
Nebraska	1	2	0	3	15	10	6	1	5	5		1	1		
New Hampshire	0	1	0	1	8	-	1	0	1	0		1			
New Jersey	16	5	7	28	30	2½	141	89	52	9	7	7	8		4
New York	24	17	16	57	52	1	352	291	61	6	15	13	10	2	7
North Carolina	2	1	1	4	9	3	12	6	6	0	2	1			
Ohio	37	12	13	62	51	1	400	219	181	66	12	12	19	2	7
Oklahoma	1	0	0	1	10	-	5	3	2	0		1			
Oregon	3	0	5	8	20	1	28	17	11	3	1	1	2	1	3
Pennsylvania	10	4	10	24	53	1	209	138	71	0	5	4	9	1	5
Rhode Island	2	0	0	2	10	6	20	18	2	0		2			
Tennessee	1	4	5	10	20	2	18	13	5	0	3	1		1	
Texas	4	2	5	11	15	3	31	18	13	0	1	5	5		
Virginia	0	2	0	2	30	-	3	3	0	0					1
Washington	1	1	1	3	14	5	7	3	4	0		2	1		
Wisconsin	10	5	2	17	56	1	126	68	58	16	5	3	2		5

(1) This tabulation gives the number of jobbing die casters, the number of captive plants, and the number of plants which are both jobbing and captive as well as the total number of establishments in the state.

(2) The oldest and the newest die casting plant in each state, in years.

(3) The total number of machines reported as installed in each state.

(4) This tabulation breaks down the installed machines by either hot chamber or cold chamber. The total number of machines equipped with vacuum attachments is not a part of the total given in the previous column.

(5) This tabulation gives the number of die casting establishments in each age group (by years). The totals may not agree with the total given for number of establishments since not all questions were answered by all respondents.

THE DIE CASTING INDUSTRY

continued from page 45

HOW OLD ARE THE MACHINES

The die casting industry is over 60 years old in this country. Yet surprisingly the greatest growth has come in the last ten years. In this ten year period over 8000 machines have been installed. The break-down by age of machines is:

Ages of Machines years	Hot Chamber	Cold Chamber	Total
under 5	2325	1976	4301
6 to 10	2155	1815	3970
11 to 15	1087	590	1677
16 to 20	234	71	305
over 20	80	64	144
Totals	5881	4516	10397

These figures on the age of die casting machines illustrate more clearly than anything else the mushroom type of growth of the industry. Based on these figures only, 4.3% of the machines now in use are more than 15 years old and only about 20% are more than 10 years old.

HOW OLD IS THE INDUSTRY

Figures for the age of die casting machines can be misleading. More pertinent is; how old are the die casting establishments. Our survey showed that out of 499 plants who replied to this question 60% are less than 16 years old. The actual figures by age are:

less than 5 years old	96 plants
between 5 and 10 years old	158 plants
between 11 and 15 years old	145 plants
between 16 and 20 years old	27 plants
more than 20 years old	73 plants

In this same period, the last 15 years, 9948 die casting machines out of a total of 10596 were purchased. In other words, the die casting shops more than 15 years old expanded at a rate almost equal to the rate of new shops being established. Here again is evidence of the rapid and vital growth of the die casting industry.

WHERE ARE THE SHOPS LOCATED

This survey showed that die casting is fairly widely distributed with concentrations of machines and establishments in the more heavily industrialized states. This, of course, is to be expected. The distribution we found is shown on the map (figure 1) and in Table I. in figure 1 the number of establishments is given in the upper figure and the number of machines installed in the lower figure. Naturally these figures are only the actual number shown by the survey and can not be projected.

Other data given in the state breakdown are the number of die casting machines by type, whether the shops are contract producers, captive shops, or both.

HOW MUCH DIE STEEL IS USED

According to the reports of the American Iron & Steel Institute there were 13,471 tons of hot work die steel sold in 1959. Our survey showed that the average die casting establishment used 6 tons of this steel per year or a total for the industry of 8892 tons. This accounts for almost 66% of the total production. Based on these reports, the die casting industry is the hot work die steel makers best customer.

FIRE RESISTANT HYDRAULIC FLUIDS

Over 59% of the 445 shops reporting on this item use some type of fire resistant hydraulic fluid. This percentage does not include those shops using water.

In this group, the breakdown by type of shop is:

	Job Shop	Captive Shop	Job & Captive	Total
Use FR fluid	141	59	64	264
No. plants	233	92	120	445

The average annual consumption reported by these plants is 606 gallons in job shops, 3700 in captive plants, 564 gallons in plants both job and captive, or for the segment of the industry reporting an average of 1295 gallons per year per shop.

Of course a projection based on such a small sample (only 176 plants reported gallonage) is somewhat dangerous. However, such a projection would indicate a potential annual use of 2,405,286 gallons. This presumably does not include the fluid initially installed when a machine is bought or changed over from petroleum hydraulic fluid.

VACUUM DIE CASTING

One of the very fast growing fields within the die casting industry is casting under reduced pressure, or so-called vacuum die casting.

Introduced only a very few years ago, this method of casting is allowing the die caster to make some parts which could not be die cast before, to make some parts much better than before, some with fewer rejects, and finally to cast alloys which could not be die cast without a vacuum aid.

This does not imply that vacuum die casting is a cure-all. It isn't. There are some cases where the best, or only, way to make a part is with vacuum. When applied otherwise it's a waste of money.

These facts were brought out in this survey. Over 3% of the die casting shops reporting said that they had one or more machines equipped for vacuum die casting. In most shops only one or two vacuum units are installed, but in others every machine can be operated either with or without vacuum.

Particularly in those shops where the majority of the work is highly intricate, must be plated, or aluminum must be anodized, vacuum die casting is growing.

Altogether, the survey shows 957 die casting machines in the country which are set up to operate under reduced cavity pressure. This is almost 10% of the total number of machines installed.

The survey also showed that the interest in vacuum die casting is expanding. Many of the companies who

do not have this sort of equipment installed now have said that they are installing it or plan to install vacuum equipment in the near future. Also, many of the companies responding indicated that they will increase the number of machines capable of doing work in vacuum. This is fairly certain evidence that vacuum die casting has a definite place in die casting.

Earlier we pointed out that vacuum die casting is a specific tool for use on some, but not all, jobs. This is borne out by the distribution of vacuum die casting units among captive and contract shops.

Type of Shop	% who have vacuum equipment
Contract	65.2
Captive	14.3
Contract & Captive	20.5

INDUSTRY GROWTH

Finally, what did this survey show about industry growth? More particularly, growth during the coming year.

We asked the die casters if they planned to purchase new machines during 1960. Almost half of those who replied said they either would buy more machines or were planning to buy them. Here again, because this particular sample represents only established shops it is unsafe to project to the entire industry. However, out of 452 replies, 193 plants had definite plans to install additional equipment, 1/4 more were considering purchases of machines, and another 52 were undecided. The balance, another 193, don't plan expansion.

Of the 207 plants planning or considering expansion, 124 of them are jobbing die casters and 54 do both job and captive work.

The indication here is clear that growth of the industry as indicated by this survey will be largely in in jobbing die casting.

Naturally this survey does not show the entry of new companies into the die casting field, nor does it show the probable future for the manufacturer of die casting machines. For the machine maker this survey shows only the probable minimum expansion since the number of machines to be added per plant and foreign sales are not included.

DOWN-TIME COSTS MAKE FIRE-RESISTANT FLUIDS INEXPENSIVE

DOWN TIME on machines has become so fantastically expensive that every possible step has to be taken to reduce it. Higher taxes, higher wages, and higher insurance rates all contribute. That's why a broken hydraulic fluid line which can cause a fire can be an outstanding liability in any die casting plant.

Three years ago the average die casting shop estimated that down time per machine cost from $35.00 to $55.00 per hour. This has gone up since then. It's only good business sense to eliminate all possible causes of down time. The use of fire-resistant hydraulic fluids is certainly one way to do it.

While none of the fire insurance underwriters are now granting a lower rate when these fluids are used, there is at least one well known company studying this problem. Present indications are that this company will recommend to the underwriters that a lower rate be granted those companies who use an approved fire-resistant fluid.

The improvement in the general market is further noted by the entrance of at least two new producing companies. At this time last year there were five known producers of acceptable fire-resistant hydraulic fluid. Now there are seven with the probability that more will soon be in the picture.

The increasing availability of good packings and seals have cut leakage so that the amount of make-up fluid required is minimized. First cost on either new equipment or on change-over is still high, but it's insignificant when compared with the loss from even a small fire.

Compensation costs are another place where study is showing that there may be an advantage to the company that uses these fluids. Skilled labor is expensive, even more expensive to train, so take care of what you have.

The accompanying table shows the sales for the past six and one-half years. The steady increase in consumption is clear.

SALES OF FIRE RESISTANT HYDRAULIC FLUIDS
(In gallons)

Year	Total Sales	Sales to Die Casting Industry
1954	512,000	336,000
1955	910,000	601,000
1956	1,318,000	842,000
1957	1,349,000	827,000
1958	1,287,000	659,000
1959	1,807,000	939,000
1960*	1,058,000	487,000

Sales figures are from seven reporting companies.
*First six months only.

NEW FINISHING PROCESSES

. . . can expand the applications of die castings

DEVELOPMENTS IN SURFACE FINISHING of die castings coupled with the more wide spread use of vacuum casting techniques can let die cast components penetrate markets previously closed to them.

CHROMIUM PLATING ON ZINC

• At least three improved plating systems are in use now. Duplex chromium, dual nickel, and crack free chromium. All three have shown greatly improved life under both CASS and Corrodekote tests. All three require a more extensive plating set-up than is usual and all three are slightly more expensive than the older, conventional copper, nickel, chromium system.

However, the improvement in corrosion resistance is so great that the added expense is certainly justified where plated zinc die castings are exposed to industrial and/or corrosive atmospheres. Typical results with the three plating systems are:

	Corrodekote	CASS
Standard system	5.2	4.0
Crack-free Chromium	6.7	6.0
Duplex Chromium	9.5	9.5
Dual nickel	9.3	9.5

(Note: The numbers are ratings determined from weighted areas to give a means of direct comparison. The higher numbers mean better corrosion resistance.)

The evidence that these plating systems can expand the field for die castings is shown by the increased use of zinc die castings on external automotive trim in 1960 and even more is expected in 1961. This field is one where plating failure was forcing the manufacturers away from die castings to either formed stainless steel or aluminum.

ANODIZING

• Through the use of vacuum die casting aluminum alloys free of silicon and copper can be die cast. A fairly wide variety of alloys including pure (99.99+A1) aluminum are used. Frequently small amounts of magnesium are added to the aluminum to increase the tensile strength. Iron should be held as low as possible and metal must be drawn from the interior of a still bath to avoid contamination with oxides and dross. At least four custom die casters are known to be experienced in die casting of anodizable metal.

There are reported to be a large number of high production parts which could, and would, be aluminum die castings if the desired color could be secured. At present, some of these applications are in plastics, but performance is not desirable. Other applications could go to anodized die castings which are in competitive materials only for lack of color. As an example, many business machine cases are plastic only to get color. These cases changed from die casting to plastic when colored machines become popular and a painted finish was not satisfactory.

In the home appliance field, trim items have been eliminated in many cases because plastics were not satisfactory and the desired colors could not be gotten with painted castings.

PORCELAIN ENAMELING

• Here's a new field that is just opening to the die caster. In the past, all frits which were compatible with aluminum required too high a firing temperature. Now a group of frits and pigments are available which can be fired at about 1000°F. If die castings are made by vacuum die casting so that they do not blister when heated and an alloy is used which will not sag at firing temperatures, the aluminum die castings can be porcelain enameled.

This development can open entirely new fields to die casting in both decorative and functional parts.

ADHESIVE BONDING

• New adhesives are continually appearing which can be used to bond metals to each other or to nonmetals. The strength of the bonds made with these adhesives varies considerably so that care must be used in the selection of materials. Also, some of the adhesives have useable strength up to 600°F. Applications of adhesive bonding of die castings have already been made. Where the strength limitations will permit, parts can be made as two or more simple castings and assembled after trimming and machining. In many cases such a technique drastically reduces tooling costs.

WELDING & BRAZING

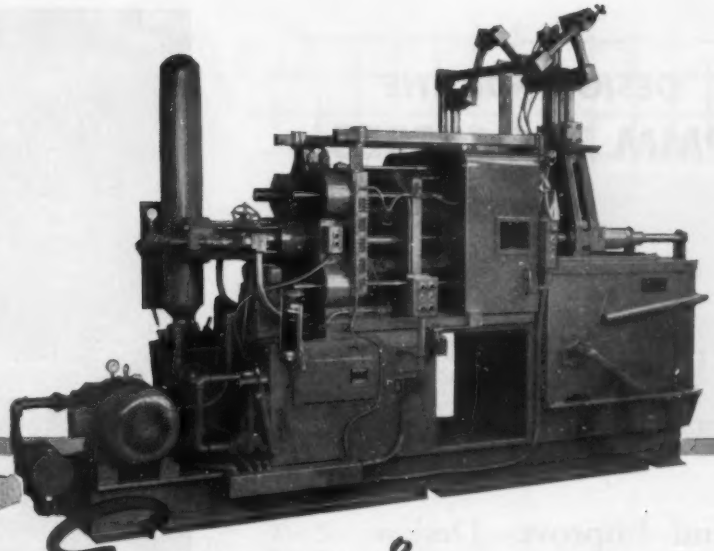
• Both the welding and brazing of aluminum structures are common practice. With die castings, however, this has been difficult due to blistering at the welding or brazing temperatures. Recent work with vacuum die casting has shown that with clean metal, cast under reduced pressure, inert-arc welding and dip brazing are both possible.

Test work is not yet complete, but all of the preliminary tests indicate welded and brazed joints are as strong, or stongrer, than the parent metal.

This should enable the design of structures which are stronger, more rigid, and less costly to make than is presently the case.

These developments in finishing die castings should let the design engineer use die castings in many ways and on much equipment which has previously been made in some other manner.

GREENLEE-B&T
AUTOMATIC ZINC
OR ALUMINUM
DIE CASTING
MACHINES



Experience

in volume production that pays off for you . . .

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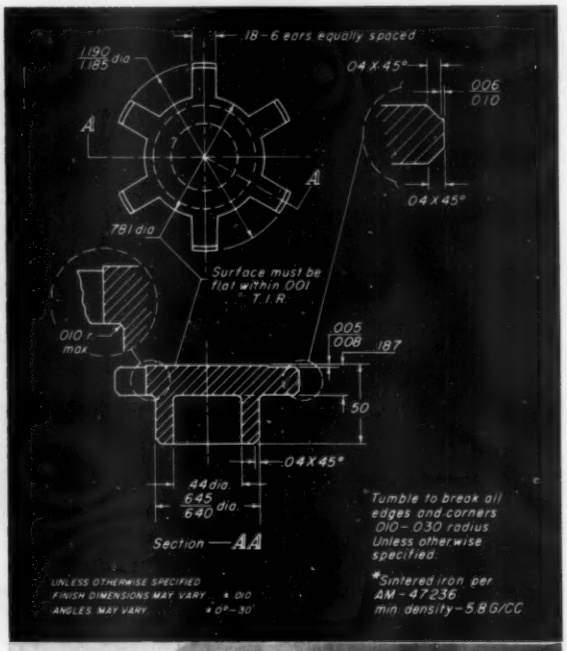
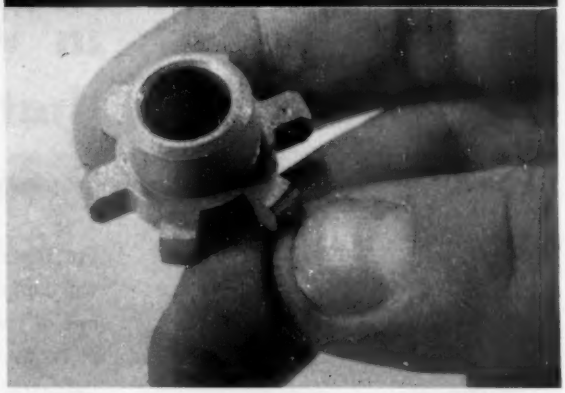
DESIGN FOR THE PMM PROCESSES

SINTERED VALVE LOWERS COSTS

. . . And Improves Design



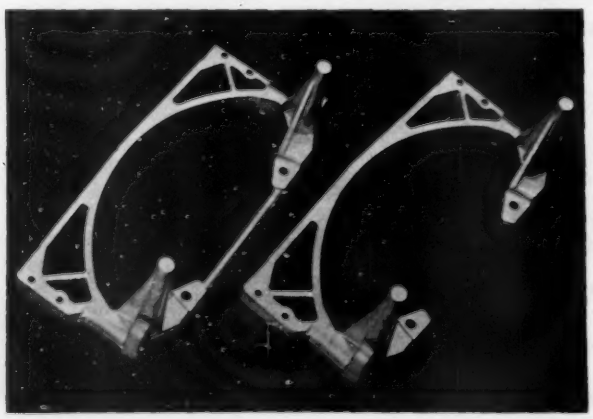


COST WAS THE PROBLEM faced by International Harvester designers on the oil filter valve shown in the illustration. Wear, corrosion, and strength were minor considerations. A machined sand casting was good enough—except—it cost too much.

Redesigning the valve as an iron sintering with a density of only 5.8 g/cc brought the cost down. What's more, there was a bonus. The original casting had three ears. That let the valve disc distort. The sintered iron part could have six ears to give adequate support with only a minor cost increase for the little bit of additional material.

The dimensions and tolerances held by Johnson Bronze Co., who manufacture the part, are shown in the blueprint. The valve is used as supplied by the vendor with only barrel finishing to remove small burrs.

DIE CASTING DESIGNED TO STAND IMPACT



IT'S A SUPPORT SEGMENT, die cast in A380 aluminum, that withstands the abuse of a typewriter.

On an electric typewriter, this 8⅝ inch by 3⅝ inch by 3½ inch high aluminum part is a main mechanical component. It must withstand the bumps and banging of margin and tabulator stops.

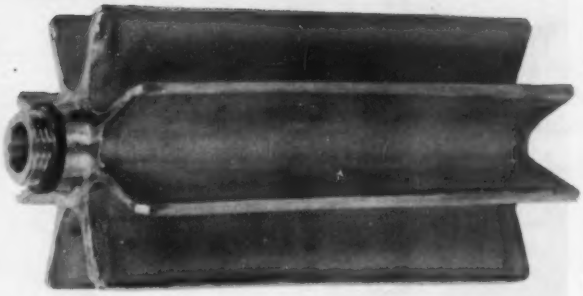
The typewriters are mass produced. This means the parts must be made quickly, accurately, and must be interchangeable. For this, die casting is the best.

The design takes into consideration a .004 tolerance between centers of two holes.

Monarch Aluminum Mfg. Co. engineers cast a tie bar between these two points. The bar prevents distortion during machining and finishing. Afterwards they remove the bar.

STAINLESS STEEL POWDER MAKES...

TROUBLE FREE SINTERED FILTER



LARGE FILTER AREA in a small space—is the big attraction for a new stainless steel powdered metal filter element.

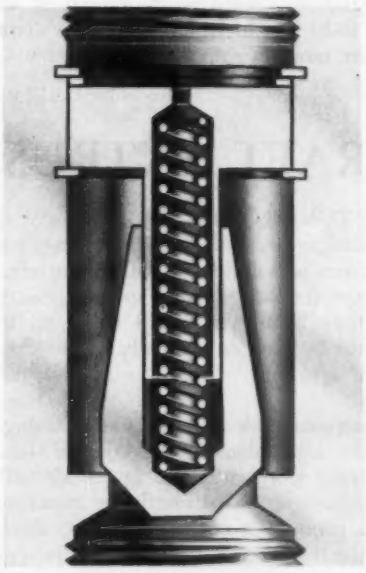
Liquid must be kept clean as it flows into sensitive new machinery and equipment. Often the space allowed for a filter is small. It's necessary to get the most filter area in the least amount of space. The new unit, made by Micro Metallic Division of Pall Corp., had to be strong for long cleaning life, the right porosity to catch the dirt and still allow the liquid to flow, and to be easily cleaned or replaced.

The best metal is a powdered stainless steel. Physical design is similar to many other elements, but smaller. It fits into a 4-inch diameter housing. It is made in 6" to 18" lengths. The 6-inch unit has a 120 square inch filter surface area.

With the large surface area, the liquid flows easily even at low pressure drops. For instance on the 6-inch unit, flow rates up to 5 gpm or 60 cfm are possible at pressure drops of only 2 to 3 psi.

Little machining is required to finish the element. The stud end requires only a threaded lip.

VALVE GUIDE IS INVESTMENT CAST



TO CUT EXPENSIVE PRODUCTION COSTS on the entire line of hydraulic check valves, was a project recently tackled by Greer Hydraulics.

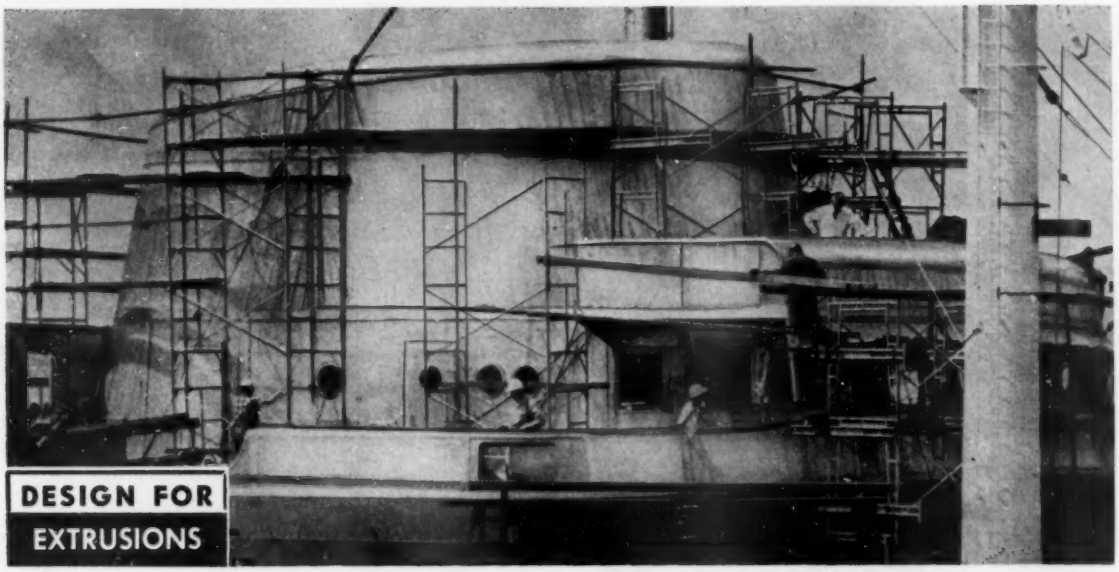
An excellent example of how it cut costs is an investment cast poppet guide.

The poppet guide, simply stated, guides a poppet that opens and allows liquid to flow in one direction only. If the liquid reverses, the poppet must close quickly and accurately. It must make a tight seat and shut off liquid flow entirely. Therefore an accurate guide is required.

To get accuracy, the guide used to be machined.

Redesigned for investment casting by Arwood Corp., the guide is easily kept to the same exacting tolerances. These tolerances are met in production quantities. The investment cast part takes 30 minutes less to make than its machined predecessor, and it will withstand equal liquid pressures.

Savings are great enough that today Greer buys only investment cast poppet guides for its entire line of check valves.



CARGO CARRIERS EYE EXTRUSIONS

FUNCTIONAL YET ADDED EYE APPEAL on an oceangoing freighter in the form of aluminum extruded shapes on the super structure.

It's Mormacpride, one of Moore McCormick Line's five new freighters equipped to handle twelve passengers each in luxury accommodations. To cut weight on the ship plus make the super structure appealing, Reynolds Product Development Division developed slip-lock aluminum shapes. The interlocking extrusions are easily installed and secured without welding or custom forming at the installation site, they are not subject to warpage.

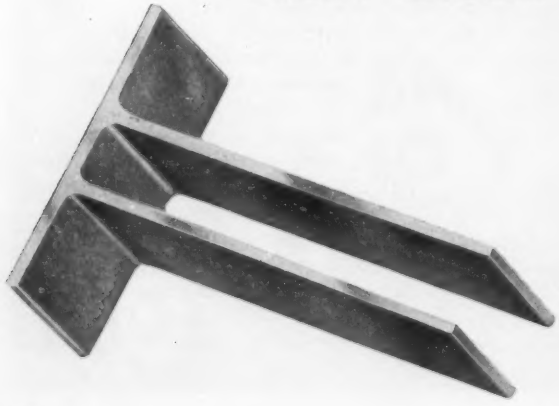
Weight saved is considerable—the extruded shaped structure is 7,000 pounds lighter than conventional aluminum structure and 77,000 pounds lighter than if made of steel. In this way, ship builders can use the heavier metals where necessary and keep weight at a minimum where it is not needed. Total weight of the slip-lock extruded aluminum is 33,000 pounds.

Extruded shapes used for railings and upright structures are made to specified requirements by the extruded parts supplier. Edges and surfaces require no machining, need only be cut to length. The ship builder then cuts and assembles the parts before loading on board ship. This eliminates awkward handling and machining in the small area of deck space available. The many sections can be easily set in place, and because of the interlocking design, they simply slide, then snap-lock securely.

The new design also adds strength to the deck housing. Instead of reinforcing plates located every two feet, strengthening elements are inherent in the extruded forms at eight inch intervals.

Part of the 33,000 pounds of extruded aluminum is in the handsome smokestack shown in the photograph. It is 10 feet high and 33 feet in diameter—and as in many modern ships, is not functional, only designed for eye appeal.

THIN GAGE AIRCRAFT EXTRUSION



NOT A TUNING FORK, but rather a shape, an unusually thin gage extruded shape, made of magnesium.

Magnesium is a difficult metal to extrude, let alone try to shape into an unusual tongue arrangement as is shown here. Entire length is 3 inches, width between blades must be kept to .44 inches after the extrusion has cooled and been straightened. Metal thickness is 1/16 inch.

This exaggerated tongue ratio at a 90 degree angle, posed quite a problem for the White Metal Rolling and Stamping Corp. It's used in the aircraft industry where lightweight and strength are important factors. When the product is cut to length, its dimensions fit perfectly to the aircraft customers requirements.

Here's a design guide to the use of . . .

SINTERED NICKEL STEELS / Part 1

by WALTER V. KNOPP, *S-K-C Research Associates, Paterson, N.J.*

The following report is taken from a paper presented by the author at the 16th annual meeting of the Metal Powder Industries Federation in April, 1960. The investigation was sponsored by the International Nickel Co. and was under the guidance of E. M. Wise.

HIGH MECHANICAL PROPERTIES in a sintering can often be gotten only at high cost. The most common way of getting high mechanical properties is to infiltrate an iron sintering with copper.

Generally good mechanical properties can be secured with infiltrated iron sinterings, but the cost is quite high. Without carbon additions, infiltrated parts do not respond readily to heat-treatment. When carbon is added, heat-treatment is possible, but the results are likely to be erratic because the copper may block the diffusion of carbon in the iron.

By the addition of only 3.5% nickel and less than 0.75% carbon to iron powder an heat-treatable alloy can be produced. This material, as heat-treated, has an ultimate tensile strength in excess of 100,000 psi, an elongation of about 2%, and a Rockwell C hardness of from 30 to 40. *(continued on page 60)*

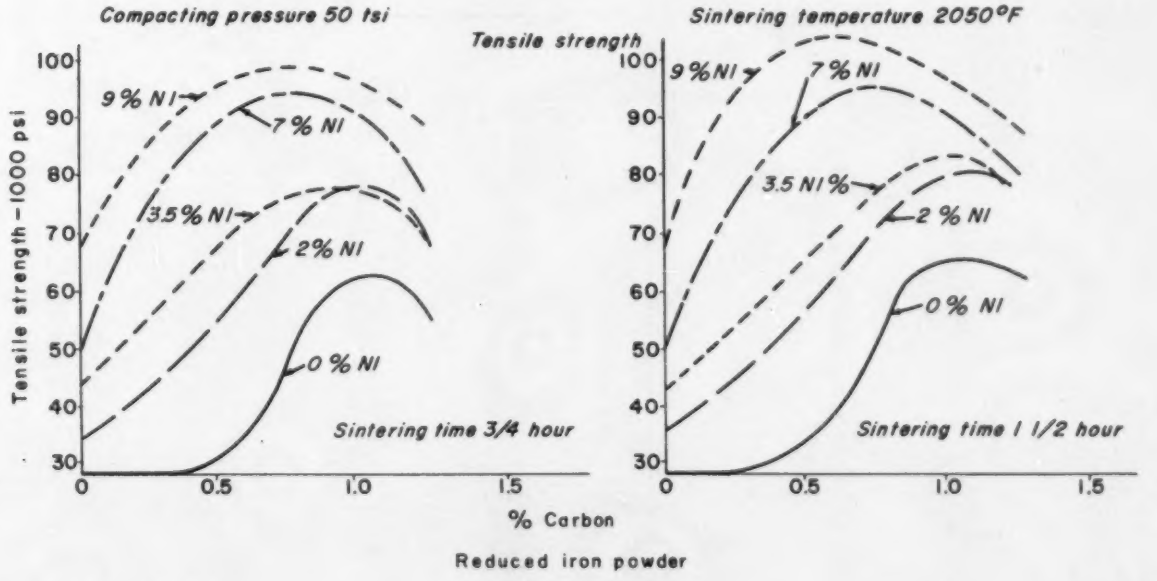


TABLE 1
PHYSICAL PROPERTIES OF IRON, NICKEL, CARBON
Reduced Iron Powder

Compacting Pressure: 50 tsi
Temperature: 2050°F
Atmosphere: Dry Hydrogen
Time: 3/4 Hour

Nickel	Final Carbon	Density, g/cc Green	Density, g/cc Sintered	Rockwell Hardness	Tensile Strength psi	Yield Strength psi	Elongation % in 1"	Dimensional Change %
0	0	7.02	7.00	H-89	27,700	11,500	10.0	−.12
	0.5	6.86	6.81	B-49	31,300	25,700	3.2	+.13
	0.75	6.85	6.79	B-63	49,800	42,400	4.1	+.15
	1.0	6.82	6.73	B-81	63,700	43,200	2.1	+.20
	1.25	6.73	6.67	B-77	55,300	51,600	1.2	+.25
2	0	6.97	7.11	B-35	35,200	19,500	13.2	−.40
	0.5	6.87	6.95	B-71	56,500	37,400	4.9	−.32
	0.75	6.84	6.94	B-82	72,000	41,800	2.8	−.27
	1.0	6.77	6.87	B-86	80,400	40,500	2.4	−.27
	1.25	6.71	6.82	B-87	68,900	59,200	2.3	−.48
3.5	0	7.07	7.08	B-48	43,500	27,600	10.9	−.47
	0.5	6.88	6.99	B-80	68,900	43,100	4.2	−.47
	0.75	6.87	6.94	B-81	78,000	61,900	4.5	−.50
	1.0	6.80	6.86	B-89	79,500	68,500	2.5	−.55
	1.25	6.71	6.78	B-87	69,200		1.8	−.40
7	0	7.01	7.13	B-62	48,500	38,300	7.6	−.52
	0.5	6.89	7.02	B-90	90,600	66,800	3.7	−.72
	0.75	6.85	7.00	B-90	96,700	81,300	2.3	−.97
	1.0	6.79	6.96	B-90	87,500	77,400	2.5	−1.12
	1.25	6.75	6.95	B-90	79,900		2.2	−1.05
9	0	7.03	7.19	B-77	65,000	52,200	4.8	−.73
	0.5	6.90	7.06	B-94	99,400	72,800	3.2	−.90
	0.75	6.88	7.07	B-91	97,000	80,800	2.8	−1.17
	1.0	6.81	7.07	B-92	98,400	71,500	2.9	−1.40
	1.25	6.74	7.01	B-95	90,200		1.9	−1.40

TABLE 2
PHYSICAL PROPERTIES OF IRON, NICKEL, CARBON
Reduced Iron Powder

Compacting Pressure: 50 tsi
Temperature: 2050°F
Atmosphere: Dry Hydrogen
Time: 1-½ Hours

Nickel	Final Carbon	Density, g/cc Green	Density, g/cc Sintered	Rockwell Hardness	Tensile Strength psi	Yield Strength psi	Elongation % in 1"	Dimensional Change %
0	0	7.00	7.00	H-89	30,200	12,000	12.3	−.12
	0.5	6.86	6.80	B-48	35,600	25,900	3.3	+.07
	0.75	6.85	6.81	B-63	53,300	31,600	4.0	+.02
	1.0	6.82	6.76	B-82	68,100	58,500	3.0	+.10
	1.25	6.73	6.66	B-78	65,000	49,200	2.2	+.13
2	0	6.97	7.13	B-38	37,400	22,100	11.9	−.45
	0.5	6.87	6.99	B-71	59,000	38,200	5.1	−.45
	0.75	6.84	6.96	B-80	72,000	47,600	4.5	−.42
	1.0	6.77	6.88	B-89	83,400	53,100	3.5	−.45
	1.25	6.71	6.85	B-87	81,100	60,000	2.5	−.63
3.5	0	7.07	7.08	B-50	44,400	26,800	11.9	−.60
	0.5	6.88	7.06	B-80	67,300	44,200	4.8	−.62
	0.75	6.87	7.02	B-83	79,500	55,300	4.5	−.67
	1.0	6.80	7.01	B-97	85,300	68,000	2.5	−.65
	1.25	6.71	6.87	B-88	79,200		2.5	−.82
7.0	0	7.07	7.20	B-64	51,200	38,500	6.5	−.68
	0.5	6.89	7.03	B-90	92,700	72,100	2.7	−.92
	0.75	6.85	7.07	B-94	99,300	79,200	3.2	−1.00
	1.0	6.79	7.03	B-94	91,200	71,200	2.2	−1.15
	1.25	6.75	6.99	B-94	83,600		2.0	−1.35
9	0	7.03	7.22	B-80	69,500	57,600	4.8	−.85
	0.5	6.90	7.08	B-97	106,800	95,000	2.3	−1.12
	0.75	6.88	7.14	B-94	104,700	94,900	2.5	−1.12
	1.0	6.81	7.09	B-92	94,900	75,700	2.3	−1.57
	1.25	6.74	7.05	B-98	96,700		1.7	−1.70

TABLE 3
PHYSICAL PROPERTIES OF IRON, NICKEL, CARBON
Reduced Iron Powder

Compacting Pressure: 50 tsi
Temperature: 2200°F
Atmosphere: Dry Hydrogen
Time: ¾ Hour

Nickel	Final Carbon	Density, g/cc Green	Density, g/cc Sintered	Rockwell Hardness	Tensile Strength psi	Yield Strength psi	Elongation % in 1"	Dimensional Change %
0	0	7.01	7.02	H-90	31,300	13,000	12.1	−.18
	0.5	6.85	6.79	B-58	42,300	29,800	3.7	−.03
	0.75	6.85	6.82	B-71	64,200	37,800	3.9	−.05
	1.0	6.76	6.72	B-86	79,600	45,000	2.5	+.08
	1.25	6.71	6.58	B-85	69,600	58,400	1.9	+.13
2	0	6.99	7.12	B-38	39,400	24,400	16.0	−.60
	0.5	6.85	7.00	B-76	63,900	42,500	5.1	−.58
	0.75	6.83	6.95	B-86	89,700	54,000	4.1	−.57
	1.0	6.76	6.85	B-92	98,000	65,300	2.0	−.57
	1.25	6.68	6.50	C-20	62,800		0.8	+.37
3.5	0	7.01	7.13	B-49	46,400	28,000	12.0	−.10
	0.5	6.88	7.06	B-82	74,800	54,000	5.0	−.72
	0.75	6.86	6.96	B-92	99,900	56,500	2.7	−.77
	1.0	6.78	6.94	B-96	103,000	88,500	2.2	−1.00
	1.25	6.67	6.79	C-18	80,300		1.4	−.70
7	0	7.02	7.20	B-63	51,200	36,300	10.0	−.80
	0.5	6.88	7.07	B-96	102,400	79,500	3.3	−1.10
	0.75	6.83	7.05	B-96	98,400	89,400	2.4	−1.22
	1.0	6.76	7.02	B-95	61,400	54,300	0.9	−1.35
	1.25	6.74	6.81	B-97	44,000		0.8	−.57
9	0	7.04	7.26	B-78	67,200	57,400	5.0	−.97
	0.5	6.89	7.13	C-23	105,300	99,000	2.3	−1.30
	0.75	6.87	7.16	B-94	88,600	61,300	2.3	−1.47
	1.0	6.79	7.12	B-93	58,200	40,000	1.9	−1.65
	1.25	6.76	6.42	C-23	38,800		1.6	+1.37

FIG. 1

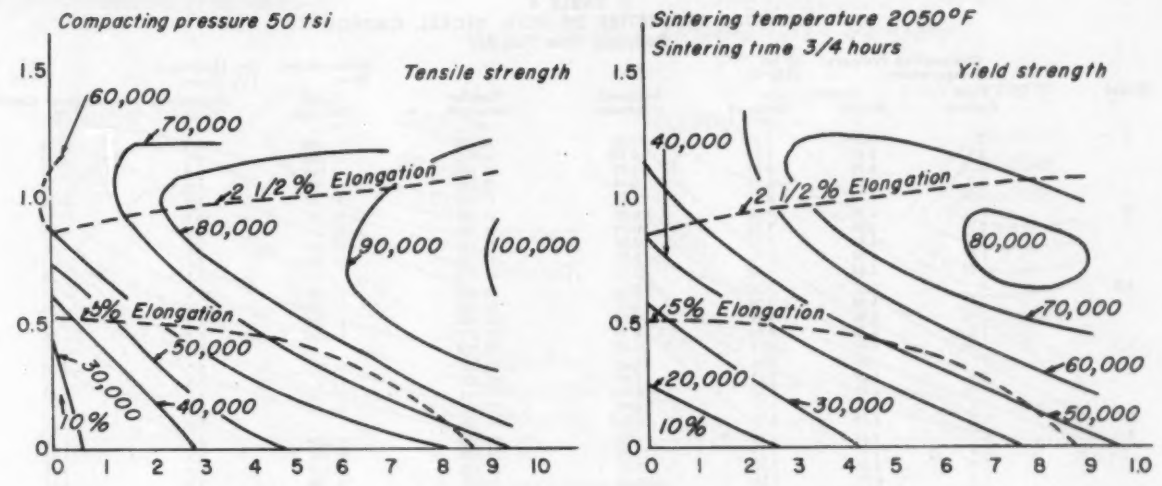


FIG. 2

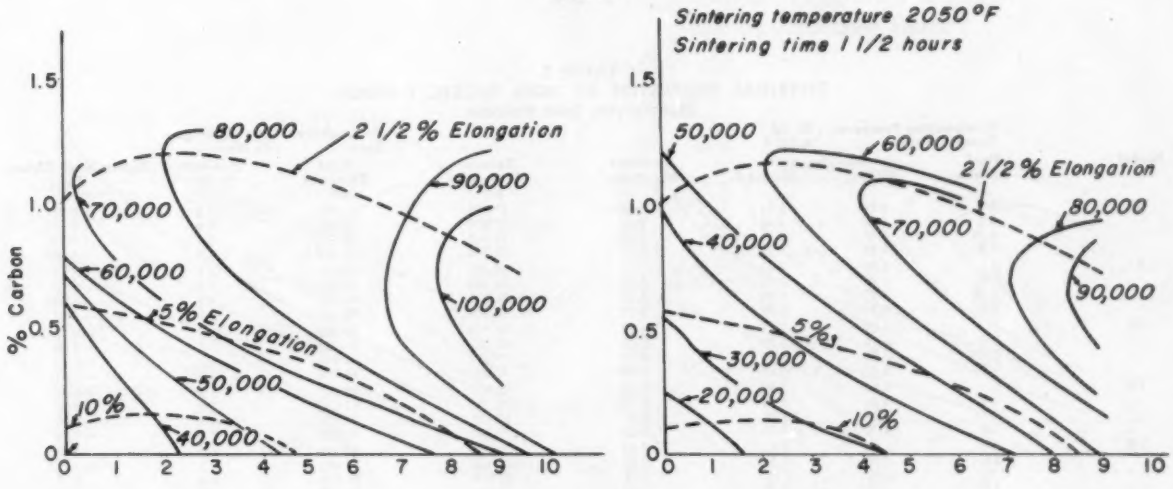
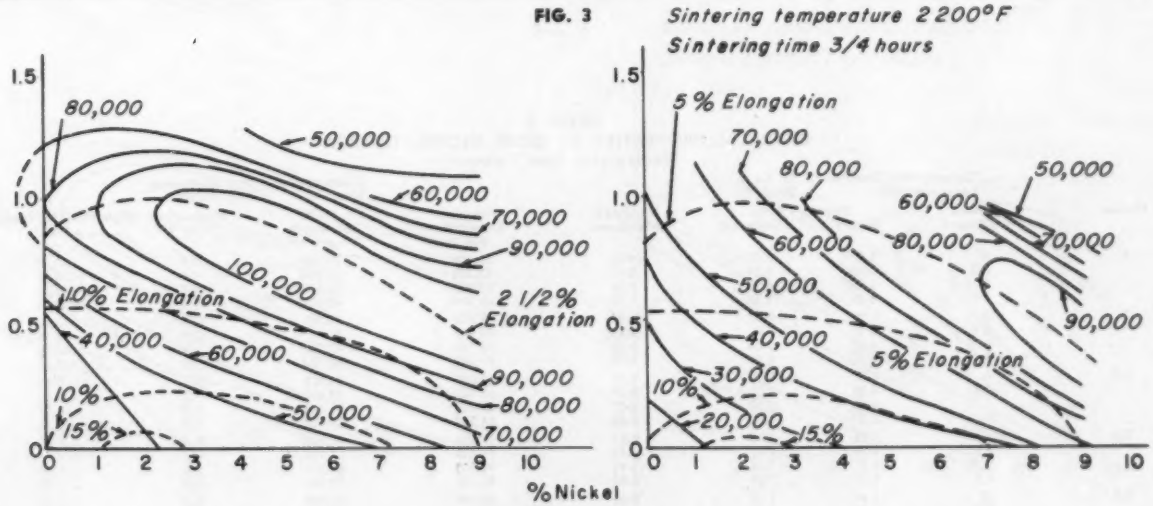


FIG. 3



Reduced iron powder

TABLE 4
PHYSICAL PROPERTIES OF IRON, NICKEL, CARBON
Reduced Iron Powder

Compacting Pressure: 50 tsi
Temperature: 2200°F
Atmosphere: Dry Hydrogen
Time: 1½ Hours

Nickel	Final Carbon	Density, g/cc Green	Density, g/cc Sintered	Rockwell Hardness	Tensile Strength psi	Yield Strength psi	Elongation % in 1"	Dimensional Change %
0	0	7.01	7.02	H-90	32,000	14,000	13 9	—.18
	0.5	6.85	6.82	B-60	46,900	30 000	5 5	—.03
	0.75	6.85	6 83	B-71	46 100	43 510	5.0	—.13
	1.0	6 76	6.75	B-88	88 800	51,000	2.8	—.10
	1.25	6.71	6 65	B-87	79,200	63,200	2.0	+.05
2	0	6.99	7.18	B-41	37,100	31,600	15.2	—.72
	0.5	6.85	7.04	B-79	68 700	44 500	5.8	—.82
	0.75	6 83	7 02	B-88	95,700	54 300	3.8	—.82
	1.0	6.76	6 92	B-95	107 100	59,700	3.1	—.77
	1.25	6.68	6 53	C-15	68,800		1.1	+.30
3.5	0	7.01	7 24	B-54	48 600	25,200	12.9	—.87
	0 5	6.88	7.08	B-87	82 000	53 000	5.1	—.97
	0.75	6 86	7.06	B-94	100,500	62,400	4.7	—1.00
	1.0	6.78	6 99	B-99	101 800	91,500	2.1	—.75
	1.25	6.67	6 79	C-20	80,900		0 6	—.72
7	0	7.02	7 24	B-65	54 200	34,820	9.1	—1 00
	0.5	6.88	7 13	B-99	102 700	75,100	2.9	—1.35
	0 75	6 83	7.16	R-100	99 900	54 900	2.0	—1 47
	1.0	6 76	7 09	B-98	57,000	30,100	1.5	—1 52
	1.25	6.74	6.75	B-102	41,200		1.0	—.55
9	0	7.04	7.32	B-82	73 300	51 600	4.8	—1.10
	0 5	6 89	7 17	C-29	106 700	89 900	1.3	—1 50
	0.75	6.87	7.22	B-99	81 930	55 900	1 7	—1 79
	1 0	6 79	7.20	B-93	53,000	36,700	2.2	—1 97
	1.25	6.76	6.49	C-22	35,800		1.1	+1.12

TABLE 5
PHYSICAL PROPERTIES OF IRON, NICKEL, CARBON
Electrolytic Iron Powder

Compacting Pressure: 50 tsi
Temperature: 2050°F
Atmosphere: Dry Hydrogen
Time: ¾ Hour

Nickel	Final Carbon	Density, g/cc Green	Density, g/cc Sintered	Rockwell Hardness	Tensile Strength psi	Yield Strength psi	Elongation % in 1"	Dimensional Change %
0	0	6.87	6 96	H-84	27 400	21,900	12.0	—0 37
	0.5	6.84	6.85	B-44	42 000	27,600	5.8	—0 015
	0 75	6 86	6 91	B-68	55 100	37 200	3.9	+0 025
	1.0	6 81	6.77	B-74	59,700	37,100	2.4	+0 050
2	0	6.90	7.03	H-92	34,100	28 000	13.4	—0 62
	0 5	6 84	6.96	B-56	51 500	32,330	5 9	—0 50
	0.75	6.87	6 99	B-70	65 6°0	43,900	4.9	—0 50
	1.0	6 80	6 88	B-76	78 800	55,100	2 5	—0.47
3.5	0	6.89	7.05	H-97	38 900	22 200	11 3	—0.72
	0 5	6 86	7.02	B-64	60 200	37 800	5 2	—0 60
	0 75	6 85	7.05	B-78	74 200	47 000	4 7	—0.72
	1.0	6.77	6 89	B-80	77,000	44,900	2 6	—0 67
7.0	0	6.86	7.05	B-53	50,900	28 200	7 5	—0 82
	0 5	6 85	7 03	B-78	79 300	53 810	3.6	—0 82
	0 75	6 87	7.04	B-84	87,800	77 200	4 5	—1.00
	1.0	6.75	7.00	B-83	79,500	67,800	2.5	—1.10
9.0	0	6.84	7.05	B-63	57,200	38 300	6.0	—0 90
	0.5	6 86	7.09	B-88	100 500	77 900	3.1	—1 10
	0.75	6.85	7.13	B-95	89 800	75 500	4.4	—1.10
	1.0	6.76	7.08	B-84	79,600	56,100	3.5	—1.50

TABLE 6
PHYSICAL PROPERTIES OF IRON, NICKEL, CARBON
Electrolytic Iron Powder

Compacting Pressure: 50 tsi
Temperature: 2050°F
Atmosphere: Dry Hydrogen
Time: 1½ Hours

Nickel	Final Carbon	Density, g/cc Green	Density, g/cc Sintered	Rockwell Hardness	Tensile Strength psi	Yield Strength psi	Elongation % in 1"	Dimensional Change %
0	0	6.87	6.92	H-84	28 400	23,900	13.9	—0.32
	0.5	6 84	6.89	B-46	43,200	27 830	5.4	—0.25
	0.75	6.86	6.94	B-66	57,900	33,500	4.4	—0.10
	1.0	6.81	6.80	B-76	68,500	53,000	2 6	—0.13
2	0	6.90	7.07	H-93	35,900	22,200	15.9	—0.80
	0.5	6.84	7.01	B-61	58,400	36 200	6.9	—0.77
	0.75	6.87	7.05	B-76	73,100	47,500	4.9	—0.75
	1.0	6.80	6.96	B-79	81,500	53,700	3.3	—0.75
3.5	0	6.89	7.15	B-38	42,000	24,400	14.2	—0.85
	0.5	6.86	7.07	B-69	65,600	39,800	5.2	—0 85
	0.75	6 85	7.08	B-82	82,800	51,600	4.9	—0 87
	1.0	6.77	7.02	B-80	86,200	55,600	3.2	—0.95
7.0	0	6.86	7.13	B-57	53,500	30,800	9.5	—1.00
	0.5	6.85	7.11	B-84	91,400	59,900	4.9	—1.10
	0.75	6.87	7.14	B-88	93,500	85,200	2.8	—1.20
	1.0	6.75	7.03	B-89	90,600	79,400	3.0	—1.35
9.0	0	6.84	7.12	B-65	58,600	46,400	6.7	—1.00
	0.5	6.86	7.17	B-93	109,000	95,200	3.6	—1.30
	0.75	6.85	7.18	B-91	95,700	83,000	3.2	—1.40
	1.0	6.76	7.08	B-95	83,300	61,700	3.5	—1.60

FIG. 4 *Compacting pressure 50 tsi* *Sintering temperature 2200°F* *Sintering time 1 1/2 hours*

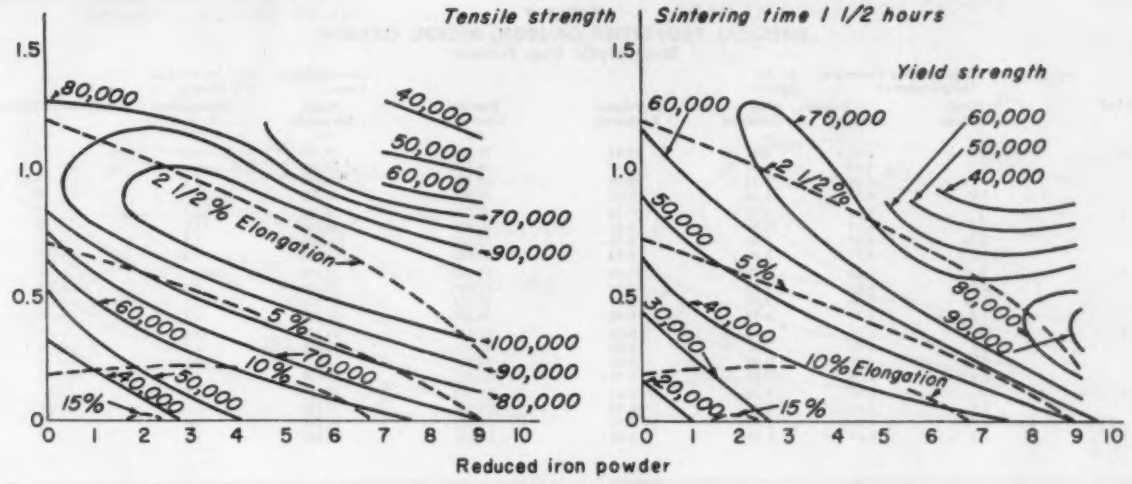


FIG. 5 *Sintering temperature 2050°F* *Sintering time 3/4 hours*

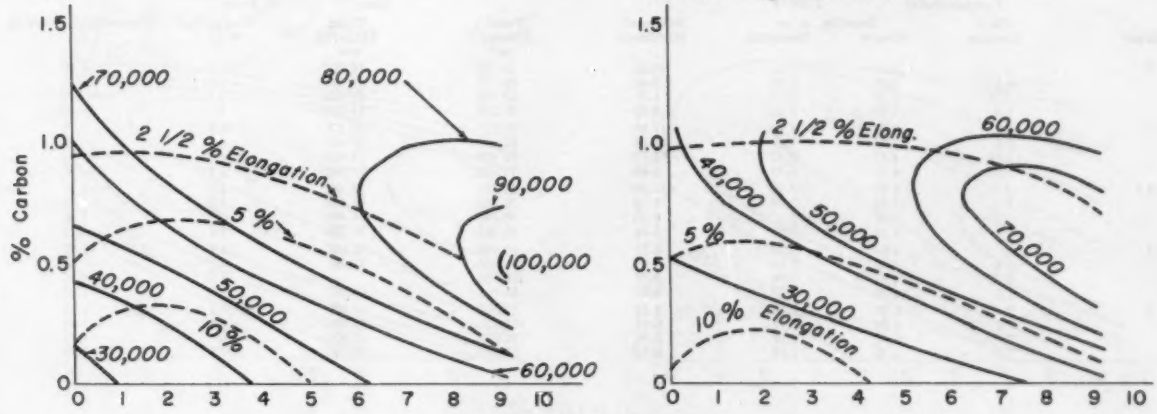


FIG. 6 *Sintering temperature 2050°F* *Sintering time 1 1/2 hours*

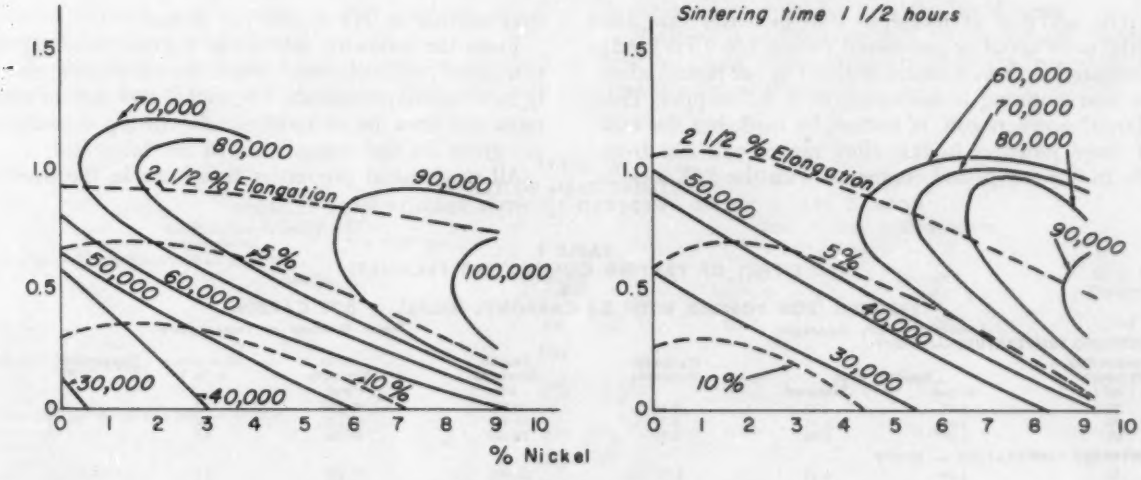


TABLE 7
PHYSICAL PROPERTIES OF IRON, NICKEL, CARBON
Electrolytic Iron Powder

Compacting Pressure: 50 tsi
Temperature: 2200°F
Atmosphere: Dry Hydrogen
Time: 1½ Hours

Nickel	Final Carbon	Density, g/cc Green	Density, g/cc Sintered	Hardness Rockwell	Tensile Strength psi	Yield Strength psi	Elongation % in 1"	Dimensional Change %
0	0	6.87	6.96	H-84	29,500	20,300	14.6	—.45
	0.5	6.84	6.90	B-49	46,600	33,500	4.7	—.22
	0.75	6.88	6.93	B-69	63,300	43,500	3.3	—.20
	1.0	6.80	6.76	B-76	67,000	43,700	2.5	—.20
2	0	6.88	7.07	H-92	35,200	26,200	16.8	—.77
	0.5	6.82	7.03	B-61	60,800	38,200	6.0	—.72
	0.75	6.87	7.00	B-75	77,500	55,400	5.4	—.75
	1.0	6.77	6.95	B-83	80,500	59,500	2.9	—.80
3.5	0	6.84	7.08	H-98	39,400	22,400	14.1	—.85
	0.5	6.85	7.03	B-69	67,800	42,200	4.5	—.85
	0.75	6.86	7.07	B-78	85,600	57,500	3.1	—.85
	1.0	6.76	6.97	B-88	93,300	67,900	2.7	—.85
7	0	6.86	7.10	B-54	50,800	34,300	10.4	—.95
	0.5	6.86	7.07	B-85	90,300	72,200	4.9	—1.10
	0.75	6.87	7.14	B-88	93,500		2.6	—1.10
	1.0	6.76	7.02	B-91	85,400	57,500	2.3	—1.20
9	0	6.85	7.14	B-63	57,200	40,500	9.1	—.97
	0.5	6.84	7.09	B-93	104,300	72,500	2.6	—1.20
	0.75	6.86	7.17	B-90	95,000	54,200	2.9	—1.20
	1.0	6.76	7.06	B-88	82,600	52,000	2.0	—1.50

TABLE 8
PHYSICAL PROPERTIES OF IRON, NICKEL, CARBON
Electrolytic Iron Powder

Compacting Pressure: 50 tsi
Temperature: 2200°F
Atmosphere:
Time: Dry Hydrogen ¾ Hour

Nickel	Final Carbon	Density, g/cc Green	Density, g/cc Sintered	Rockwell Hardness	Tensile Strength psi	Yield Strength psi	Elongation % in 1"	Dimensional Change %
0	0	6.87	7.01	H-86	28,800	18,900	16.0	—.47
	0.5	6.84	6.98	B-50	45,700	33,500	6.1	—.35
	0.75	6.88	6.99	B-71	67,100	41,400	3.7	—.35
	1.0	6.80	6.88	B-82	81,300	51,200	3.2	—.37
2	0	6.88	7.14	H-94	36,700	26,200	20.5	—.95
	0.5	6.82	7.09	B-64	63,300	38,400	6.5	—.92
	0.75	6.87	7.12	B-77	82,400	59,800	4.3	—.92
	1.0	6.77	6.94	B-88	95,700	59,500	2.9	—.37
3.5	0	6.84	7.15	H-98	40,200	28,600	16.5	—1.10
	0.5	6.85	7.08	B-73	70,700	42,400	5.7	—1.10
	0.75	6.86	7.10	B-83	90,700	56,400	4.1	—1.00
	1.0	6.76	7.00	B-90	98,200	76,700	3.8	—1.20
7	0	6.86	7.16	B-55	50,500	40,500	11.5	—1.20
	0.5	6.86	7.14	B-86	95,400	77,300	4.2	—1.20
	0.75	6.87	7.19	B-91	100,900		2.5	—1.30
	1.0	6.76	7.07	B-95	86,900	60,500	2.4	—1.50
9	0	6.85	7.15	B-62	57,000	50,400	9.5	—1.20
	0.5	6.84	7.12	B-97	104,600	78,200	2.0	—1.40
	0.75	6.86	7.20	B-95	96,500	60,800	2.7	—1.40
	1.0	6.70	7.14	B-92	53,300	50,700	1.9	—1.80

The addition of nickel to iron increases raw material costs about 4¢ per pound (when 3.5% Ni is used) compared with an increase of about 9¢ per pound when an iron sintering is infiltrated with 20% copper. Prealloyed powders can, of course, be used, but the cost of these powders in this alloy range, will run from 25¢ to 30¢ per pound compared with the 3.5% nickel-iron mixture at 17¢ to 18¢ per pound.

From the following tables and curves, the designer can select the mechanical properties which most nearly meet his requirements. The nickel and carbon contents can then be determined. Processing conditions are given for the convenience of the fabricator.

All mechanical properties listed are in the as-sin-

TABLE 9
EFFECT OF VARYING COMPACTING PRESSURES
ON
REDUCED IRON POWDER WITH 3.5 CARBONYL NICKEL + 0.75 CARBON

Atmosphere: Dry Hydrogen
Time: ¾ Hour at Temperature

Compacting Pressure tsi	Density, g/cc Green	Density, g/cc Sintered	Rockwell Hardness	Tensile Strength psi	Yield Strength psi	Elongation % in 1"	Dimensional Change %
SINTERING TEMPERATURE — 2050°F							
30	6.47	6.52	B-68	50,900	41,300	3.3	—0.28
40	6.68	6.73	B-77	61,900	40,600	2.6	—0.42
50	6.87	6.94	B-81	78,000	61,900	4.5	—0.50
SINTERING TEMPERATURE — 2200°F							
30	6.47	6.61	B-77	66,400	47,300	3.0	—0.92
40	6.68	6.80	B-83	71,800	53,000	4.0	—0.85
50	6.86	6.98	B-92	99,900	56,500	2.7	—0.77

FIG.7

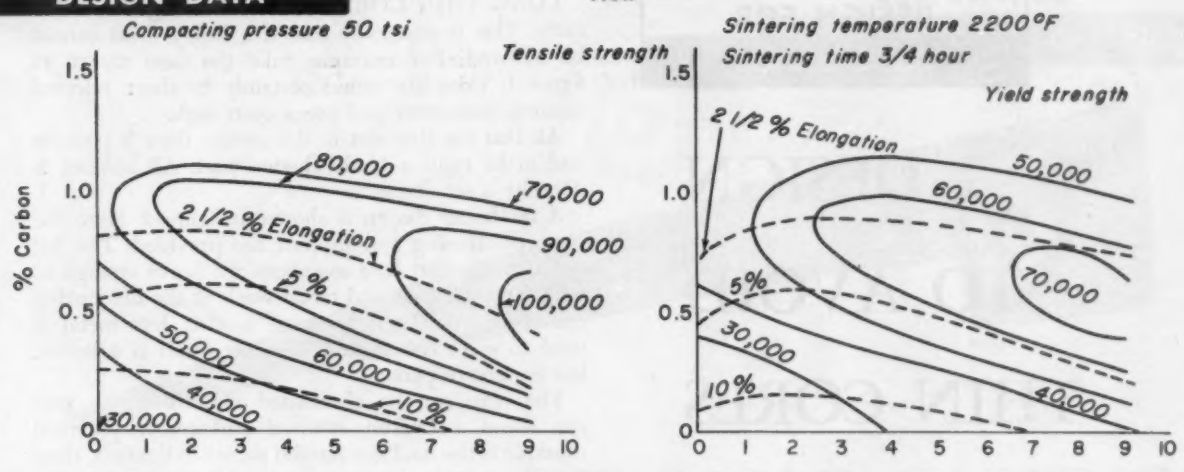
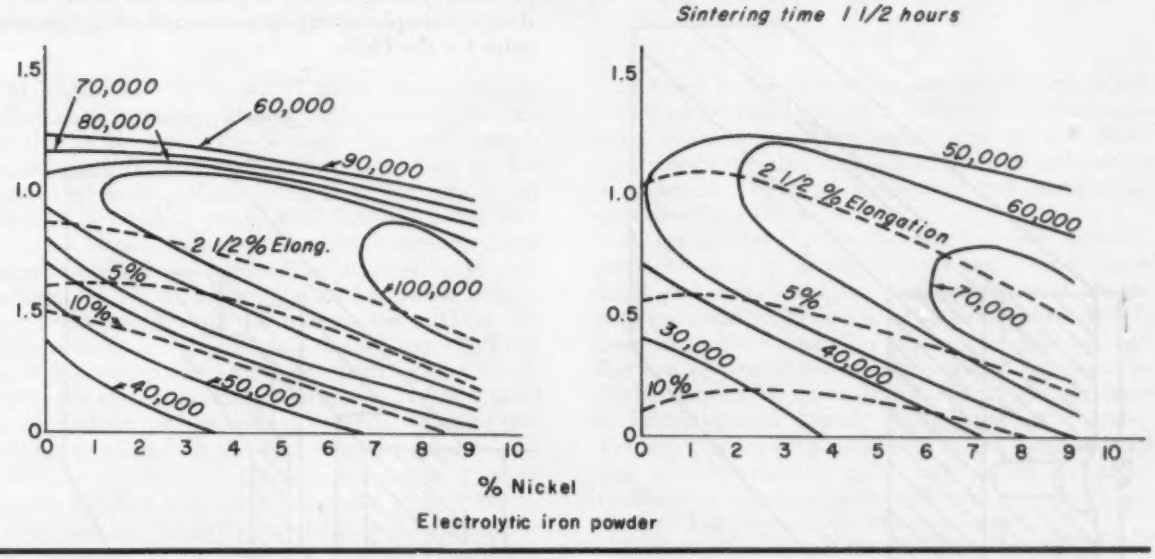


FIG. 8



tered condition. Heat-treatment will materially increase ultimate tensile strength and hardness at, of course, the expense of elongation.

All properties listed were determined on standard tensile test bars. Properties of molded parts will vary depending on the configuration. They should not, however, depart too far from the listed ones.

(Editor's note: Powder and processing information will be given in the second part of this report to be published next month.)

TABLE 10
EFFECT OF HEAT TREATMENT
REDUCED IRON POWDER WITH 3.5 CARBONYL NICKEL + 0.75 CARBON

Compacting Pressure: 50 tsi — Time: ¾ Hour at Temperature
Atmosphere: Dry Hydrogen

	Density, g/cc	Rockwell Hardness	Tensile Strength psi	Strength Yield psi	% in 1" Elongation
SINTERING TEMPERATURE — 2050°F					
Sintered	6.94	B-81	78,000	61,900	4.5
Quenched in Oil From 1550°F		C-49			
Tempered For 1 Hour					
400°F		C-38	150,000	——	2.0
720°F		C-27	118,000	——	1.7
SINTERING TEMPERATURE — 2200°F					
Sintered	6.96	B-92	99,900	56,500	2.7
Quenched in Oil From 1550°F		C-51			
Tempered For 1 Hour					
400°F		C-43	168,000	——	2.0
720°F		C-32	135,900	——	1.7

DESIGN FOR
DIE CASTINGS

DESIGN TO AVOID THIN CORES

LONG THIN CORES tend to burn, gall and fail early. This is especially true if a heavy draft cannot be allowed. For example, take the case shown in figure 1. Core life would certainly be short, rejected castings numerous, and piece costs high.

All that the thin slot in the casting does is position and make rigid a blade shaped part. All holding is done by a set screw.

A far better design is shown in figure 2. Here the same positioning and support are provided. The big difference is that core members are heavy enough to withstand the heat and metal wash of the die casting operation. Another advantage is that less metal is used to make the casting. The net result is a better, less expensive part.

The core can be eliminated entirely if the part can stand a broken external surface. A practical example is the hacksaw handle shown in figure 3. Here only heavy die sections are used with no movable cores. The space between the offset "ladder rungs" provides spacing needed to position the blade. In this design, a simple sawing operation at the front provides entry for the blade.

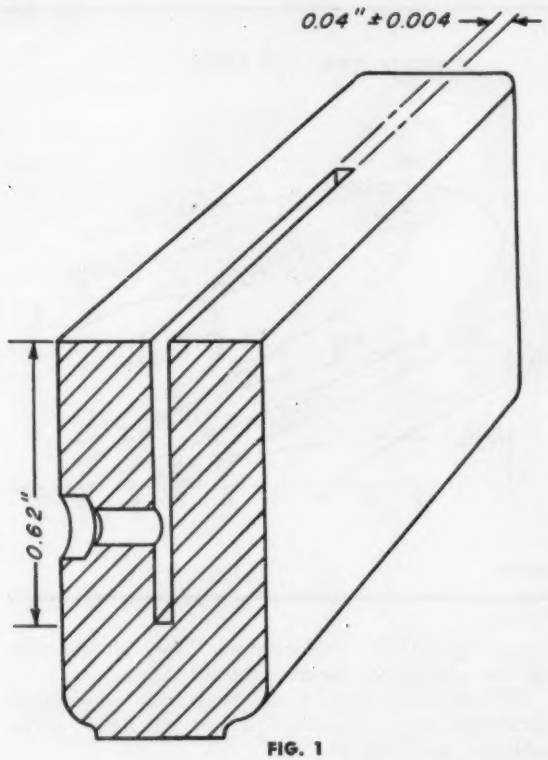


FIG. 1

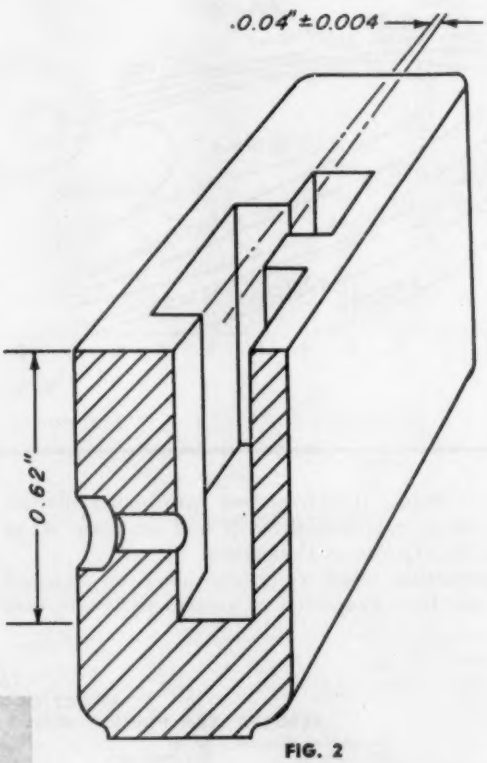


FIG. 2

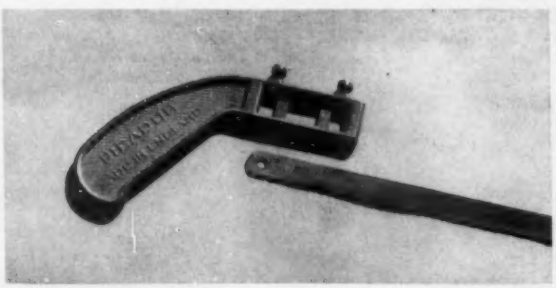


FIG. 3

DESIGN FOR
PERMANENT MOLD CASTINGS

FIG. 1

ZINC PERMANENT MOLD CASTINGS

By HIRAM K. BARTON, *European Editor*

ALUMINUM PERMANENT mold castings occupy an established position in design engineering paralleling that of aluminum die castings. The two methods are complementary; very frequently a product utilizes permanent mold castings when it is first introduced and the demand is small, thus limiting initial tool costs. As demand grows, production is expedited and manufacturing costs reduced by converting to die-castings. Additional to these applications where permanent mold castings are an interim stage, there are others where such fatcors as a steady but small demand, the incorporation of design features that would slow a die casting machine uneconomically, or a need to use undiecastable alloys, all combine to make permanent mold casting the best long-term choice.

Neither in the United States nor Britain (where foundry practice is strongly influenced by U.S. precedents) has any similar parallel arisen in the case of the zinc-base alloys; these are invariably used for die castings only. Primarily, this is because the casting of zinc alloys in permanent molds demands exactly the same rigorous control of metal composition as is recognized to be essential in die casting, but which is difficult to maintain under ordinary foundry conditions. Foundry workers accustomed to the more accommodating aluminum alloys often do not realize the deleterious effect of overheating, and over-fluxing, upon zinc-base alloys.

In continental Europe, however, a few specialist producers—mainly in Scandinavia and France—have developed metal-handling techniques, mold design principles and mold operating methods which enable them to produce zinc alloy permanent mold castings that are very nearly as strong, section for section, as die castings in the same alloy. Prominent among these is Etablissements Mecal, of Aubervilliers (Seine), France. This foundry specializes in the production of zinc alloy permanent mold castings for industrial applications where high strength and good finish are essential but required quantities are small.

Typical of such applications is the bracket shown in fig. 2, which weighs over six pounds and must have

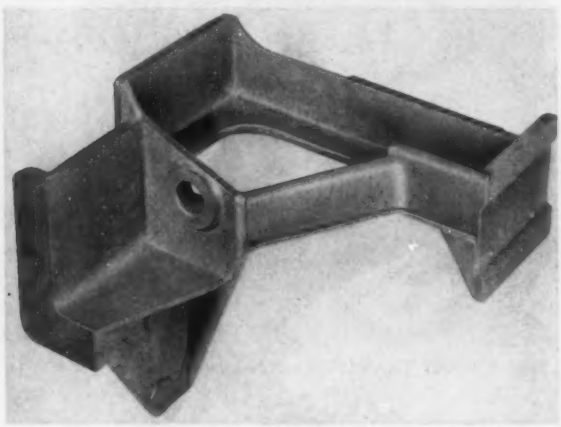


FIG. 2 ADEQUATE STRENGTH and rigidity are in this part.

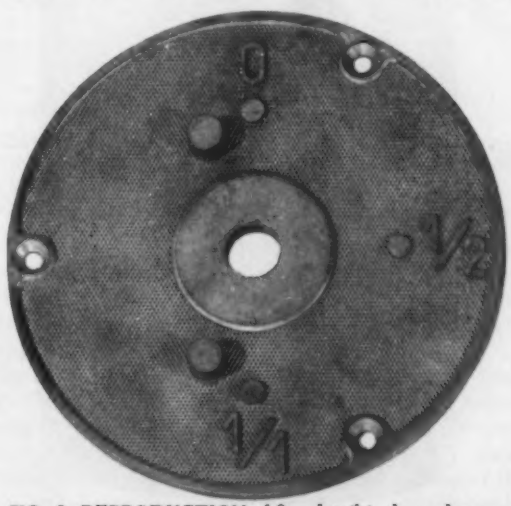


FIG. 3 REPRODUCTION of fine detail is shown here.

FIG. 4 GOOD STRENGTH, low cost in limited quantities.

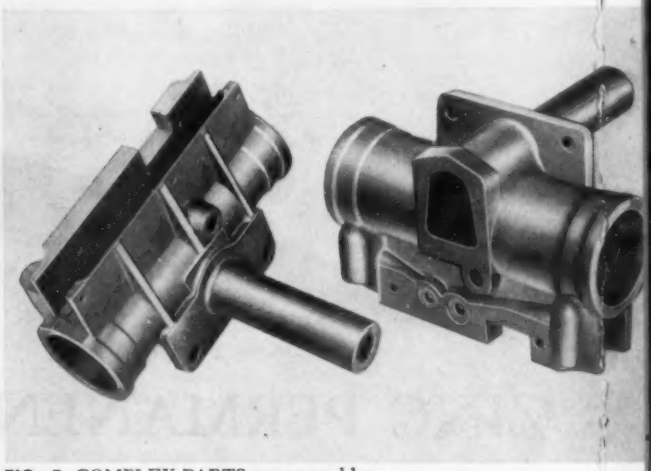


FIG. 5 COMPLEX PARTS are no problem.

a dense and homogeneous structure to resist shock loading. Permanent mold castings in zinc, if properly gated and risered, have exactly the same solidity and freedom from any sort of porosity that characterizes aluminum alloys cast in permanent molds, so that the full inherent strength of the metal is obtained in heavy sections.

The sharpness of detail attainable is generally of a higher standard than that of permanent mold cast aluminum, primarily because thick mold dressings are not necessary. Fig. 3 shows a regulator cover disc about six inches across, on which the definition of the characters and other surface details is hardly inferior to that expected if the disc were diecast. The handle for a trophy (fig. 1) shows the reproduction of decorative detail on a part that is to be buffed and electroplated.

Bevel gears (fig. 4) for various purposes are familiar as zinc alloy die castings, and this is unquestionably the best and cheapest method of producing

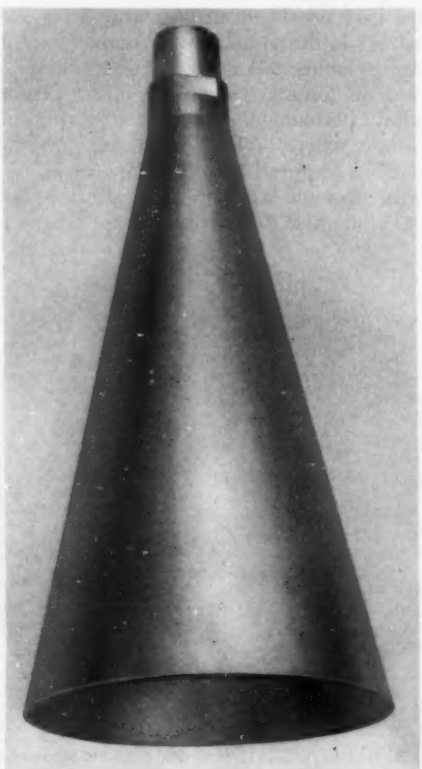


FIG. 6 FOR LARGE AREAS heavy walls may be needed.

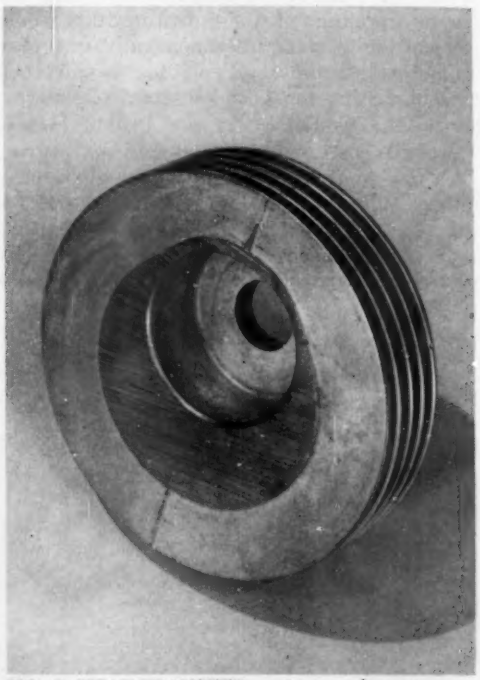


FIG. 7 HEAT TRANSFER sections can be cast.

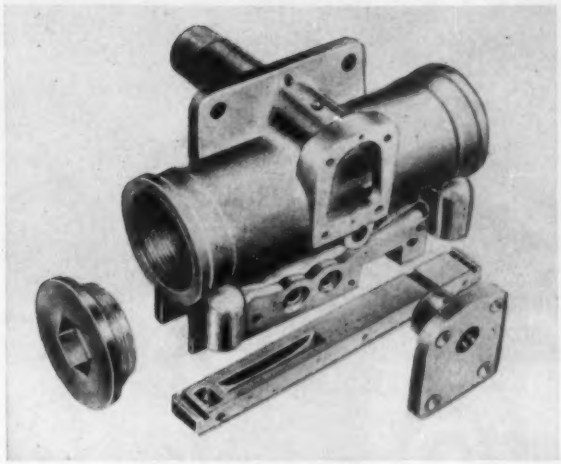


FIG. 8 INTRICATE CORING is easily done.

precision gears when the quantities required will amortize the die cost. When only a few hundred large gears are to be cast, however, the permanent mold process gives the buyers the high strength and dimensional precision needed for proper functioning without incurring high tool costs and at a piece cost far below that of machined gears.

Tool costs are relatively lowest when the component to be produced has many cored holes. These add little to the cost of a permanent mold but greatly

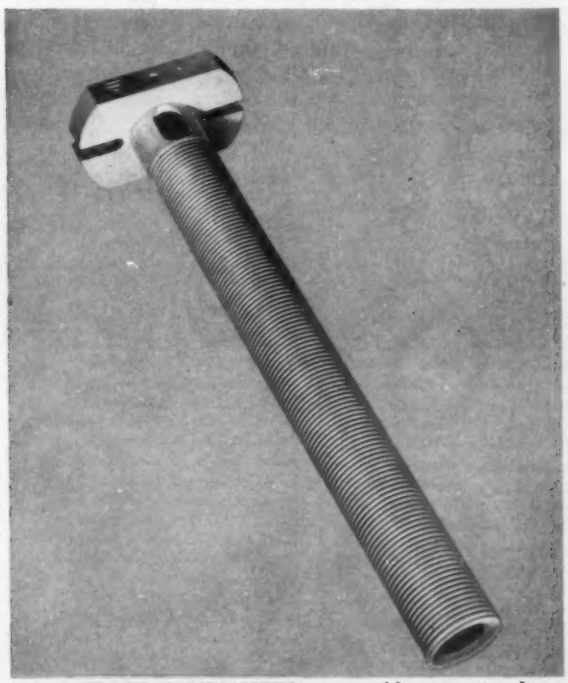


FIG. 9 CLOSE TOLERANCES are possible at parting lines.

to the cost of a die casting die. The casting of fig. 5, cored from end to end and with a number of smaller cross holes, is the windscreen wiper bracket for French State Railways electric locomotives. This is a critical application where absolute reliability is essential, and the strong zinc alloy bracket, which weighs more than six pounds, has the added advantage of being easily machinable. The cored axial hole is bored to take a plunger, and the ends are threaded to accept screwed caps. These and other minor parts of the assembly (fig. 8) are also cast in permanent molds, at a considerable saving over the previous cost of machining them from bar stock.

Although wall thicknesses of zinc alloy gravity castings must be appreciably greater than would be necessary if the parts were die cast, in order to assure free metal flow under gravity, it is possible to cast components of moderately large surface area with a mean wall section of 0.125-in or even 0.100-in. This is so, for example, with the conical funnel-shaped casting of fig. 6, which is twelve inches long. It is also practicable to cast components with heat-transfer fins of large surface area, as indicated in fig. 7. The dark area in this illustration is where the runner-metal has been sawn off, and is typical of the heavy feeding essential to the filling out of the fins in castings of this type.

Because of the low melting point of the alloy, molds operate at a relatively low temperature. This enables closer limits to be held than are practicable with higher melting point alloys, especially across the mold parting. Thus, in the hollow adjustor column of fig. 9, an external thread several inches long is cast to form with sufficient precision to be put into service without chasing or sizing with a die. This component, like all the others featured here, is cast in alloy AC41A,

TABLE I

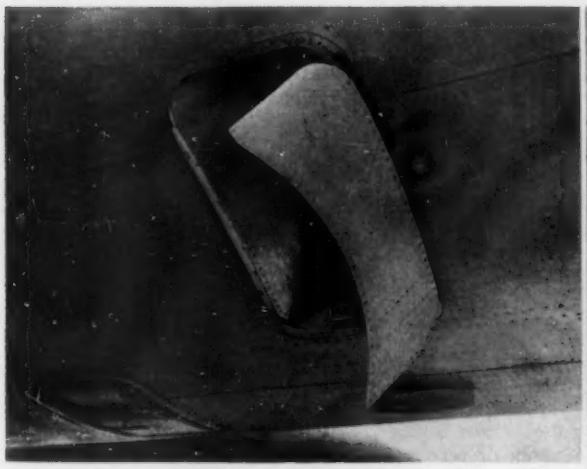
Comparative properties of permanent mold cast and die cast zinc

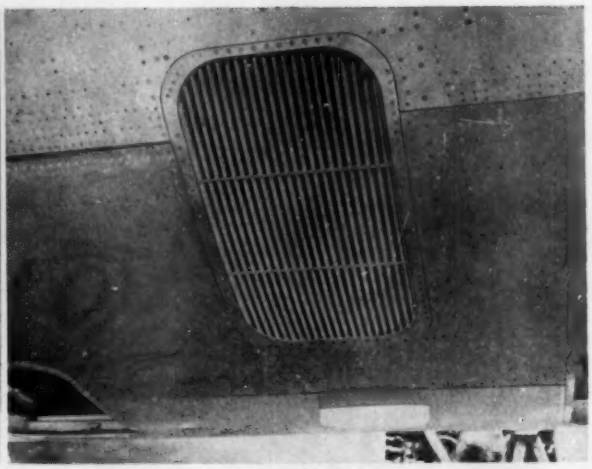
Mechanical Property	Die cast*	Permanent mold cast
Tensile Strength tons/in²	21.7	15.8
Elongation % on 2"	9.8	6 to 8
Impact Strength ft. lbs (on ¼" sq. bar) kgm/cm²	42.9 16	** 15
Brinell Hardness	90	90

*The values are "original"—measured 5 weeks after casting
**No French value for this test; pro rata it would be app. 40 ft. lbs

ASTM Spec. B86-57T (Zamak 5). The small copper content of this alloy gives it slightly superior fluidity, and this is a real advantage when operating with only a small hydrostatic head instead of several tons of injection pressure.

As Table I shows, zinc alloy permanent mold castings have approximately 80 percent the tensile strength, 85 percent of the elongation, nearly 95 percent of the impact strength and exactly the same Brinell hardness as die cast zinc alloy, provided the same conditions of metal-handling are maintained.





FROM 38 ASSEMBLED PARTS . . . . TO 7 PARTS

ELECTRA "JET'S" DIE CAST LOUVERS INCREASE AIR FLOW

LOCKHEED ELECTRA JETS had a ventilation problem. There was not enough air-flow through the freon condenser tunnel which provides in-flight and ground cooling and auxiliary ventilation.

The logical answer was to open a door in the fuselage, but while the plane was in flight, this open and protruding door took a beating from the air flow.

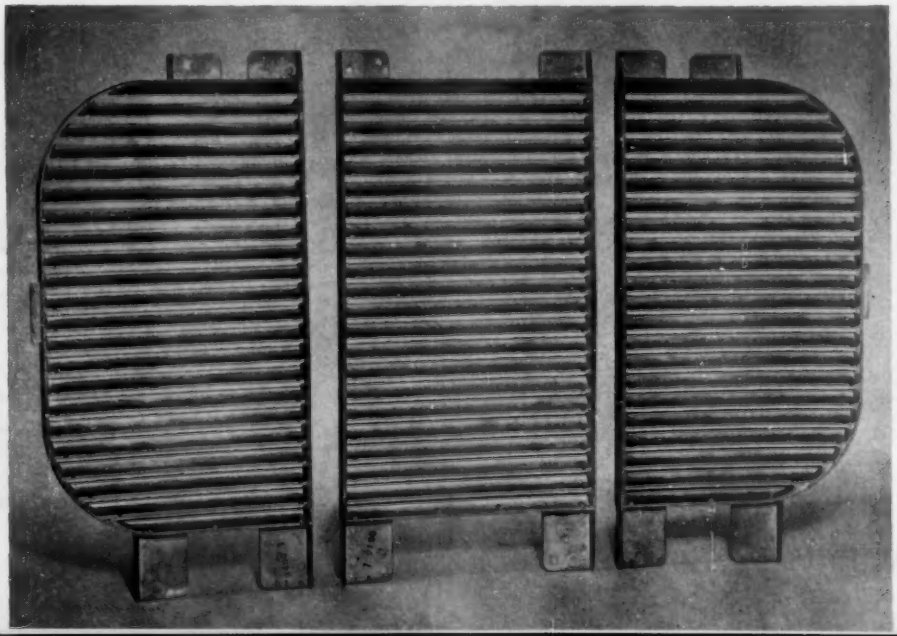
The solution proposed was to insert a louver in place of the door.

There are several ways this louver can be made. One way is to buy stock metal parts, cut them to size, bend, machine, weld, or bolt, smooth off rough edges and install the finished product. The manufacturing steps require a great deal of labor and a great deal of time to make each louver.

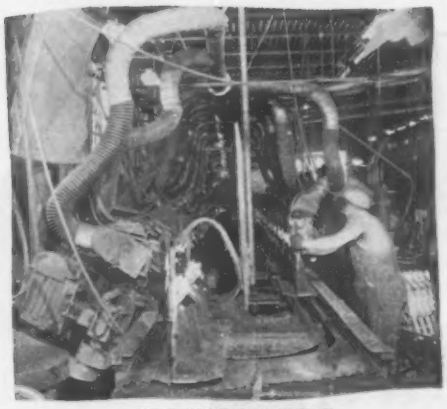
Lockheed asked a custom die caster to produce the louver. It was decided to make it of aluminum.

By die casting the louver in three parts, strength was added to the thin strips. Frame, flanges and strips produced as one casting eliminated assembly costs.

Most pressing reason for designing the louver was to get good air flow, but the benefits didn't end here. Important is the elimination of 38 assembled components in the original door. The new die cast assembly has a total of seven parts which cut a great deal of manufacturing and material costs.



THREE major sections of louver are die cast.



AUTOMATIC BUFFING

TRIMMING

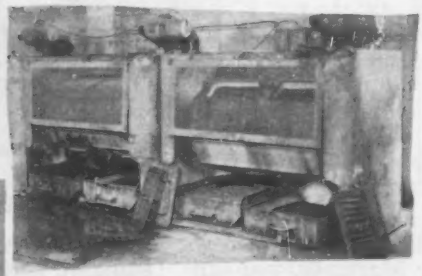
AUTOMATIC PAINTING

PMM

The specialized finishing metals, equipment and materials used to machine, assemble, surface condition or surface coat precision metal molded parts are presented here.

FINISHING SECTION

PORCELAIN ENAMELING ALUMINUM PAGE 69



BARREL FINISHING

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PLATING

HAND BUFFING

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Model	Tub Capacity	Tub Size, Inside		
		Length	Width	Height
VT-70	¾ gallon	7″	4¾″	6″
VT-71	1 cu. ft.	12″	12″	12″
VT-72	2½ cu. ft.	15″	16″	18½″
VT-75	5 cu. ft.	31″	17″	19½″
VT-77	7 cu. ft.	31″	17″	22½″
VT-712	12 cu. ft.	35″	25″	30⅜″
VT-717	17 cu. ft.	47″	25″	30⅜″

New VT-72 Vibrasheen being unloaded into optional hoist-pan. Note convenient height of controls.

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The uniform vibratory motion of the media in recessed areas, blind holes and small I.D. dimensions make it possible to obtain optimum results on a multitude of applicable parts with intricate configurations that can not be completely processed in standard horizontal barrel machines.

What's more, this amazing metal finishing machine only requires 50% of the floor space that is taken up by any other machine of this type with a similar capacity. Time and motion is at the absolute minimum with all convenient operating conditions.

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PORCELAIN ENAMELING ALUMINUM

A LOST MARKET to the die and permanent mold casting industry is that group of products which require, or could best use, a porcelain enamel finish.

With few exceptions, porcelain enamel frits which were available required a firing temperature higher than the castings could stand.

Now a new group of frits are available which can be fired at about 1000°F. With the proper selection of casting alloy this brings castings within the porcelain enamel field.

Du Pont developed the materials for this work. They have a group of 12 frits, a compatible addition agent, opacifiers, and pigments. They're suitable for use on almost any aluminum product; cast, extruded, or rolled.

Du Pont says of these enamels: ". . . low temperature enamels are applied on aluminum, aluminum alloys, and aluminized steel. They have been evaluated for use on magnesium alloys and certain grades of stainless steel.

"The enamels are composed of low-melting glass frits, a mill suspension agent, pigments, and an opacifier. The materials are supplied as separate components, ready for blending by wet grinding in standard ball mills.

"The enamels may be produced in a variety of colors and surface glasses. They are resistant to alkaline detergents, sulfides, mild acids, and salt water. They withstand mild abrasion. The enameled metal may be cut, sawed, drilled, punched, or water-quenched after enameling.

"While the enamels are suitable for a wide variety of uses, they should not be applied to the interior surfaces of cooking utensils or other vessels used for preparing foods."

FRITS

Frits are melted glass which has been shattered into rice-size particles by water quenching.

FRIT L388—A general purpose frit for work with all pigments except those containing cadmium (e.g., reds, yellows, and oranges). It has good comparative chemical resistance. Suggested firing schedule: 5-9 minutes at 1000°F. minimum temperature.

FRIT N845—Contains cadmium and is used with cadmium bearing (red, yellow, and orange) pigments. It has good comparative chemical resistance similar to Frit L388. Suggested firing schedule: 5-9 minutes at 1000°F. minimum temperature.

FRIT K402—A blue frit used for obtaining dark or royal blue enamels where large additions of pigment might be detrimental to the surface texture of the fired enamel. This frit should not be used with cadmium-bearing pigments. Suggested firing schedule: 5-9 minutes at 1000°F. minimum temperature.

FRIT K944—A blue, cadmium-bearing glass for specialty applications where a bright green or blue-green requires the use of a cadmium-bearing yellow pigment. Suggested firing schedule: 5-9 minutes at 1000° F. minimum temperature.

FRIT J470—A low lead, cadmium-free frit which matures at 1000°F. Specifically, it is used for producing high opacity white enamels but may be used with all non-cadmium-bearing pigments. The frit is slightly more corrosive to aluminum than is L388 but can be controlled in the Du Pont alkaline chrome pretreatment system.

FRIT J502—A low lead, cadmium-free frit maturing at 1000°F.-1020°F., suitable for use with all noncadmium-bearing pigments. Superior acid resistance makes J502 particularly adaptable to architectural applications. The alkaline chrome metal pretreatment is most important in applying J502 as this frit is corrosive to unprotected aluminum surfaces. Pretreatment procedures should be followed closely, using baths of proper strength.

FRIT J503—A low lead, cadmium-bearing frit maturing at 1000°-1020°F., suitable for use with cadmium-bearing pigments. This frit is the counterpart of J502. The precautions used with J502 in pretreating the metal must be observed.

FRIT J150—A frit used where low maturing temperatures are required for all pigments except those containing cadmium. Sug-

gested firing schedule: 5-9 minutes at 960°-980°F. minimum temperature. Because of its lower firing temperature, J150 is less chemical-resistant than the higher firing enamels and is, therefore, used primarily for indoor applications.

FRIT J232—A frit similar to J150 for use with cadmium-bearing red, yellow, and orange pigments. Suggested firing schedule: 5-9 minutes at 960°-980°F. minimum temperature. Like J150, J232 is less chemical-resistant than higher firing enamels and is used primarily for indoor applications.

FRIT J405—A leadless frit maturing at 1000°F. It is suitable for cadmium or noncadmium pigments and is used as a cover enamel over conventional ground coatings. It also may be applied directly to aluminum, following a hot alkaline chrome pretreatment and prefire. Frit J405 is particularly suitable for application directly on austenitic stainless steels (specifically No. 302). Its comparable chemical resistance is good.

FRIT J527—A resistant borosilicate frit containing no lead, cadmium, antimony, barium, selenium, or arsenic. This heavy metal-free frit, a recent Du Pont development, is designed for use on appliances, including dish washers, clothes washers and dryers, cabinets, countertops, refrigerators, and the outside of cooking utensils.

Frit J527 is corrosive to aluminum and, therefore, should not be used for direct application on the aluminum surface but rather as a cover coat over conventional ground coats.

In the presence of food acids, the boron release is considered to be high, and Frit J527 should not be used for the interior surfaces of utensils used in cooking foods. Coloring pigments must be selected carefully to avoid the introduction of toxic heavy metals.

FRIT J532—A lead-free frit suitable for all pigments. Chemical resistance is good. Suggested firing schedule: 5-9 minutes at 1000°F. minimum temperature. Overchromating should be avoided. While this frit is lead-free, it does contain other heavy metals.

ADDITION AGENT

The addition agent serves three purposes: (1) it suspends the milled enamel slip, (2) it provides dry hardness in the unfired enamel surface, and (3) it prevents cracking or craze tearing. Agents normally used in steel enameling are not suitable for use with these low-melting glasses since gums carbonize and clays tend to produce hard, porous surfaces.

ADDITION AGENT L389

Addition Agent L389 is a syrupy liquid. About 5%-10% by weight (average 7.5%) of the agent is used in milled formulations. Higher concentrations will increase the set but excessive amounts may be detrimental to acid resistance. If additional set is required in an enamel after the maximum amount of L389 has been used, small quantities (1%-2%) of boric acid may be added to the milled slip to improve the set.

It is important that enamel slip containing L389 not be stored for prolonged periods or where temperatures are substantially higher than normal room temperature. Excessive heat during either milling or storage may cause a rapid "setting-up" of the slip, after which it is not recoverable. It is customary to water-cool the mill during the milling operation or to add the addition agent just before (10-15 minutes) the conclusion of the grind.

Addition Agent L389 should not be stored at low temperatures or for longer than one month. Should it solidify or gel through prolonged storage, it may be added as a solid or, if preferred, can first be reverted to a liquid by warming. Water may be added to replace evaporation losses. Note: Addition Agent L389 is highly alkaline.

Contact with the skin must be avoided.

OPACIFIERS

Titanium dioxide has proved to be the most adaptable opacifier in low-melting glasses, but not all grades of titanium are suitable. Good gloss whites are obtained with 12-20 parts of suitable grades of titanium dioxide per 100 parts of frit. Pastel colors usually require 1 part coloring pigment and 6 parts of titanium dioxide per 100 parts of frit. For obtaining matt textures, the titanium dioxide content may be adjusted as high as 20-25 parts per 100 parts of frit.

The following grades of titanium dioxide have been used successfully:

"Ti-Pure" R-100 titanium dioxide.

"Ti-Pure" FF titanium dioxide (for matt textures).

PIGMENTS

Pigments marked with an asterisk should be used only in Frits N845, K944, J232, J503, and J405. All other pigments may be used in any frit.

Ivory	K901
Ivory	K902
Yellow	K903
Yellow*	K904
Yellow*	K906
Yellow	K945
Yellow	K946
Blue-Green	K907
Green	K908
Green	K909
Green	K910
Blue	K911
Blue	K912
Blue	K913
Blue	K914
Blue	K915
Brown	K916
Brown	K917
Brown	K918
Brown	K919
Brown	K920
Orange*	K921
Orange*	K922

continued on page 72

Zinc, brass, and steel parts are all plated in the same Levelmax bright nickel solution with outstanding results, in National Plating Corporation's semi-automatic operation in Cleveland.

For outstanding brightness, ductility, adhesion, and leveling:

LEVELMAX

BRIGHT NICKEL PROCESS

The new Levelmax process now assures a bright smooth nickel coating for poorly polished steel, dull copper plate, unbuffed stampings and castings. Simple to control and maintain, Levelmax can be used under standard plating conditions. It has a high tolerance to organic and metallic contamination. The process provides excellent leveling action. The resulting bright nickel surface accepts chrome readily. Highly ductile, Levelmax permits crimping and forming operations. Extremely high current densities are permissible with conventional or air agitation. Nickel coverage is provided in recesses without burning in high current density areas. The process meets the requirements of varied product shapes, base metals and applications, reducing or eliminating surface buffing and polishing, and bright plating hard-to-buff areas. To date, Levelmax is being used in hundreds of thousands of gallons of nickel solution. Write or call for complete working details, to Federated Metals Division, American Smelting and Refining Company, 120 Broadway, New York 5, REctor 2-9500, or call your nearest Federated Sales Office.

ASARCO

AMERICAN SMELTING AND REFINING COMPANY

FEDERATED METALS DIVISION

Where to call for information:

ALTON, ILLINOIS
Alton: Howard 5-2511
St. Louis: Jackson 4-4040

BALTIMORE, MARYLAND
Orleans 5-2400

BIRMINGHAM, ALA.
Fairfax 2-1802

BOSTON 16, MASS.
Liberty 2-0797

CHICAGO, ILL. (WHITING)
Chicago: Essex 5-5000
Whiting: Whiting 826

CINCINNATI, OHIO
Cherry 1-1678

CLEVELAND, OHIO
Prospect 1-2175

DALLAS, TEXAS
Adams 5-5034

DETROIT 2, MICHIGAN
Trinity 1-5040

EL PASO, TEXAS
(Asarco Mercantile Co.)
3-1852

HOUSTON 29, TEXAS
Orchard 4-7611

LOS ANGELES 23, CALIF.
Angelus 8-4291

MILWAUKEE 10, WIS.
Hilltop 5-7430

MINNEAPOLIS, MINN.
Tuxedo 1-4109

NEWARK, NEW JERSEY
Newark: Mitchell 3-0500
New York: Digby 4-9460

PHILADELPHIA 3, PENNA.
Locust 7-5129

PITTSBURGH 24, PENNA.
Museum 2-2410

PORTLAND 9, OREGON
Capitol 7-1404

ROCHESTER 4, NEW YORK
Locust 5250

ST. LOUIS, MISSOURI
Jackson 4-4040

SALT LAKE CITY 1, UTAH
Empire 4-3601

SAN FRANCISCO 24, CALIF.
Atwater 2-3340

SEATTLE 4, WASHINGTON
Main 3-7160

WHITING, IND. (CHICAGO)
Whiting: Whiting 826
Chicago: Essex 5-5000

IN CANADA: Federated Metals Canada, Ltd.
Toronto, Ont., 1110 Birchmount Rd., Scarborough, Phone: Plymouth 73246

Montreal, P.Q., 1400 Norman St., Lachine, Phone: Melrose 7-3591

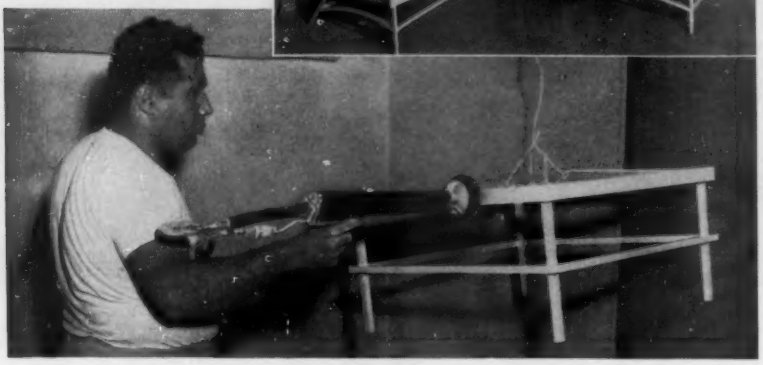
Circle No. 74 on Reader Service Card

What Would

75% PAINT SAVINGS

Mean in YOUR Finishing Department?

Designed for the New Decade—Beautifully styled BAL HARBOUR line of aluminum furniture by AFCO was winner of the 1960 Apollo Award for pre-eminence in design. The uniform, high quality finish is applied electrostatically with the Ransburg No. 2 Process Hand Gun.



Faster . . . Cleaner . . . Cheaper—The "wrap-around" feature of the No. 2 Process Electrostatic Hand Gun paints all areas of this type of work from one side only, providing a 75% paint savings and a 700% increase in production volume over former air hand spray.

RANSBURG

Ransburg No. 2 Process Electrostatic Hand Guns are providing a 75% paint savings in the painting of beautiful AFCO aluminum furniture.

AFCO Aluminum Furniture Co., Inc., Miami, Fla., replaced hand spray with two Ransburg Electrostatic Hand Guns. Along with paint and labor savings, quality of the work was improved with greater uniformity. And, production volume was increased a healthy 700%! Formerly, they were painting approximately 100 items a day. NOW, with the faster, cleaner Electrostatic Hand Guns, they paint from 700 to 800 pieces per day. Electrostatic is faster because the "wrap-around" characteristic of Electro-Spray paints all areas of this type of work with a pass from one side only.

NO REASON WHY YOU CAN'T DO IT TOO

Write for information and literature about this revolutionary, new painting tool. See how the Ransburg Electrostatic Hand Gun can save time . . . paint . . . and cut costs in YOUR finishing department. If your production justifies, it'll pay you to investigate Ransburg's *automatic* electrostatic spray painting equipment. Write for our No. 2 Process brochures which show numerous examples of modern production painting in both large and small plants.

RANSBURG Electro-Coating Corp.

Box 23122, Indianapolis 23, Indiana

Circle No. 78 on Reader Service Card

PORCELAIN ENAMELING ALUMINUM *continued*

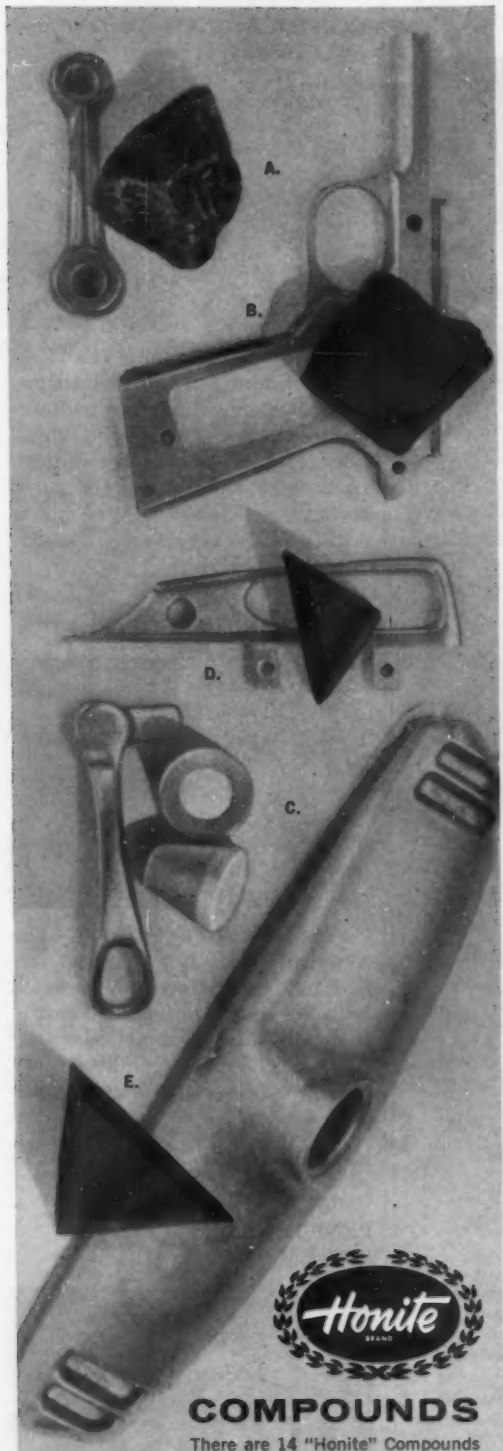
Red*	K923
Red*	K924
Red*	K925
Red*	K926
Red*	K927
Red*	K928
Black	K929
Black	K930

Most formulations for enameling aluminum contain 100 parts by weight of frit, 7.5 parts by weight of addition Agent, varying amounts of opacifiers or pigment or both, and from 35 to 45 parts by weight of water.

These enamels may be used on almost any permanent mold casting and on most vacuum cast die castings. In the case of die castings it seems to be essential to use vacuum casting to avoid surface bubbles when the part is heated to the proper firing temperature. Generally, an aluminum alloy low in silicon and copper is most desirable since both of these alloying agents tend to lower the melting point of the metal quite materially.

Before any part is specified as porcelain enameled it should be checked to make sure that the alloy used to make the casting will stand the firing temperature without distortion. Generally, better results are secured if the part is enameled over the as-cast surface. Machining or heavy sanding may destroy the chilled skin so that less predictable results are secured.

Much of the material for this report was contributed by the E. I. Du Pont De Nemours & Co. (Inc.)



3M gives you the keys to

BETTER BARREL FINISHING

with a complete line of "HONITE" Brand Products

Now from 3M research come the most efficient barrel finishing materials. A complete line of abrasive media and compounds to meet all your deburring, descaling, deflashing, coloring and burnishing needs and perform precision surface finishing.

For free advice on selection of media, compounds and recommendations on equipment see your "Honite" Field Engineer or Distributor. He is trained and experienced to help you. He'll be happy to sample process your materials or conduct a "Honite" demonstration.

"HONITE" MEDIA

These five types of "Honite" Brand abrasive media are recognized as the best and most complete line for barrel finishing.

A. "HONITE" – A tough, low cost, long-wearing natural stone containing a micro-crystalline abrasive. Excellent for minor stock removal and burnishing in long run cutting cycles. Available in nine sizes. *The steel alloy outboard motor crankshaft pictured was descaled and smoothed with "Honite" and "Honite" Compound #280 followed by #373.*

B. "SUPER-HONITE" – A manufactured chip consisting of a fine-grained, fused aluminum oxide bonded abrasive. Fast cutting and long-wearing – provides a fine, smooth finish on all types of metal. Available in nine sizes. *The hard steel automatic pistol frame was deburred with "Super-Honite" and "Honite" Compound #240; polished with "Super-Honite" and "Honite" Compound #120.*

C. "HONITE" BRAND CERAMICONES – A long-wearing porcelain-type, ceramic medium manufactured in precise cone-shaped dimensions. Ideal for deburring, honing, coloring, or burnishing where lodging is a problem. *The yellow brass handle pictured was deflashed and smoothed with "Ceramicones" and "Honite" Compound #300.*

D. "HONITE" BRAND Z-N TUMBLING SHAPE – A light-weight medium featuring a new bonding material and extremely fine mesh abrasive. Designed to produce fine surfaces on zinc alloys and other metals prior to plating. Often eliminates the need for costly buffing. *The zinc die-cast locker handle pictured was honed and burnished for plating with "Z-N" 3T Tumbling Shape and a newly developed "Honite" Compound.*

E. "HONITE" BRAND C-R TUMBLING SHAPE – A light-weight, fast-cutting medium for use on all metals. Triangular shaped and extremely fracture resistant to prevent lodging. Light weight produces fine, micro-inch finishes without impingement. Available in three sizes. *The aluminum alloy vacuum cleaner head was deburred and prepared for painting with "C-R" 2T Tumbling Shape and "Honite" Compound #240.*

HERE'S HOW you can get the latest information on barrel finishing. VISIT THE "HONITE" BOOTH AT THE NATIONAL METAL EXPOSITION IN PHILADELPHIA OCTOBER 17-21.

Honite BRAND

COMPOUNDS

There are 14 "Honite" Compounds designed for all types of finishing. Select the compound that fits your needs from these classifications.

1. "HONITE" Abrasive compounds for rapid surface cutting and deburring.
2. "HONITE" Finishing compounds for burnishing, coloring, and light deburring.
3. "HONITE" Cleaning compounds for grease, oil, and scale removal.

Send for FREE booklet

3M COMPANY • 900 Bush Ave., St. Paul 6, Minn.

Gentlemen:
Please send me a copy of your free booklet on "Honite" Barrel Finishing: "There's Gold in Them Thar Barrels."

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

"HONITE" AND "3M" ARE REGISTERED TRADEMARKS OF 3M CO., ST. PAUL 6, MINN. EXPORT: 99 PARK AVE., NEW YORK 16, CANADA: LONDON, ONTARIO.

MINNESOTA MINING AND MANUFACTURING COMPANY
...WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

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NEW PRODUCTS

(continued)

CLEANER-PHOSPHATIZER

TURCO PRODUCTS, INC.—Paintite phosphating compound simultaneously cleans and phosphatizes iron, steel and zinc. Applied by immersion, spray washer, or steam cleaner, it produces a light, tight, smooth and uniform phosphate coating. This assures paint adhesion and prevents the rapid post-rusting.

Circle No. 238 on Reader Service Card

MOLD SPRAY

SPRAYON PRODUCTS, INC.—Sprayon No. 205 silicone mold release spray contains pure silicone in an aerosol can to gain the low surface tension necessary for maximum release. It cuts casting rejects and reduces spotting and sticking.

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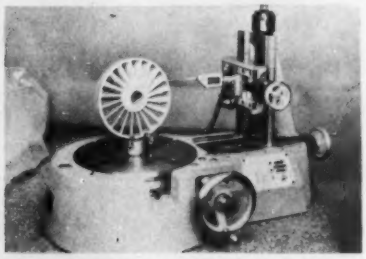
CONTOUR MEASURING INSTRUMENT



TURBOTRONICS CORP.—The Contour-O-Scope universal contour measuring instrument simultaneously measures form and thickness. The low-priced unit inspects parts with multi-faced, contoured surfaces with ease.

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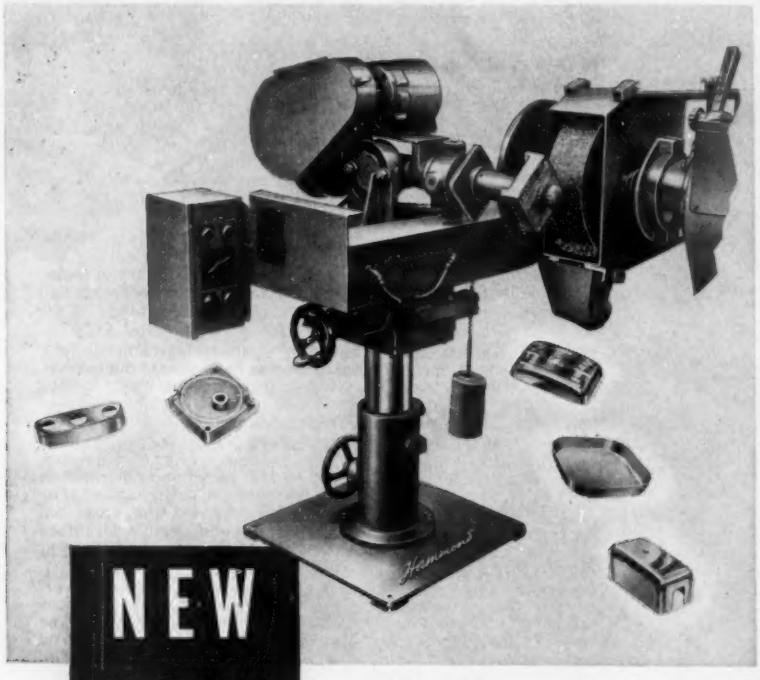

NEW

Hammond

CAMMED JUNIOR AUTOMATIC

Work Holding Machine

The new Hammond Cammed Junior Automatic (Model EPC) is especially designed to hold other than round work pieces while being polished or buffed by a regular polishing and buffing lathe or abrasive belt machine. In addition, it will hold round parts as large as 14" in diameter.

The Hammond Junior Model EPC is automatically cycled. When variable work dwell timer is started by pushbutton, the work spindle starts and the cam and work are moved into contact with the cam follower and wheel through the pressure weights with speed of movement being controlled by an air cylinder.

The pre-set timer permits work to dwell at finishing wheel for required periods up to one minute, when work is automatically air retracted to load-unload position and work spindle stopped. Weight can be varied to suit correct finishing pressure.

Cams are designed to suit each work piece and finish requirement. The standard adjustable 14" dia. cam follower disc is bracket mounted on the machine and is set on center with the wheel spindle.

Hammond Machinery Builders Inc.

1642 Douglas Ave. Kalamazoo, Michigan

See us at the Production Engineering Show. Navy Pier, Chicago, Sept. 6-16.

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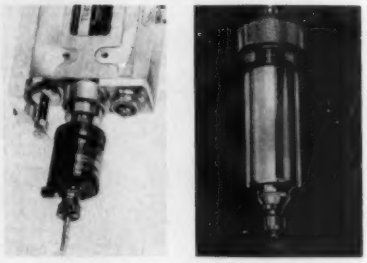
POWER DRILL & QUILL



PRECISE PRODUCTS CORP.—The Autodrill (left) is a compact air-hydraulic drill, electrically operated with full control of feed and stroke. The units can be mounted on 2" centers. The Power Quill (right) runs at constant speed under load over a wide RPM range.

Circle No. 241 on Reader Service Card

PENETRANT INSPECTION SYSTEM

PICKER X-RAY CORP.—PIXchek is a quick, economical, dye-penetrant

inspection system for detecting surface flaws in industrial materials. Dye penetrant is drawn up by a developer from the defect to make a red stain pattern on a white surface. Interpretation of the stain pattern indicates the type flaw in the material.

Circle No. 242 on Reader Service Card

IMPREGNATION UNIT

IMPREX, INC.—The Model S-280-EAA impregnation unit combines efficiency with a capacity of 56 cubic feet of castings per hour. One unit, used to process unmachined aluminum die castings, was recently re-assembled in a customer's plant in 1½ hours. The design makes it a simple matter to shift major components to fit any plant.

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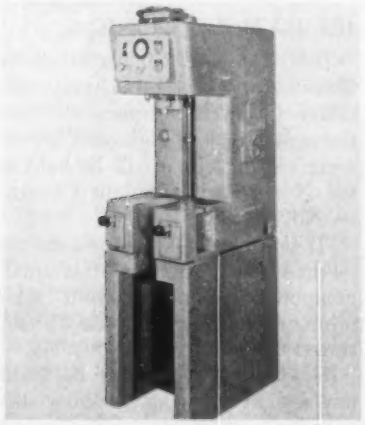
TRIMMING PRESSES



FAMCO MACHINE CO.—A new line of hydraulic presses from 2 to 10 ton capacities have maximum rigidity and ample work area. All operating controls are grouped within full view and easy reach.

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To get the most out of your barrel finishing

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 SERVICE MEN • OVER 160 MATERIALS

"Media-matched" Oakite compounds offer extra barrel-finishing economies

Any experienced barrel-operator can tell you that best results come from the right media and compound "mix"... where media and work are matched; and the compound matched not only to the work but also to the media.

Some signs of a good match: clean and efficient media; enough lubrication to assure a smooth finish; and faster cutting down, deburring and burnishing.

How to avoid a mismatch? That's where Oakite service can help you. Combine the Oakite man's experience with the tremendous variety of acid, solvent, and abrasive Oakite compounds available, and you're sure to be right.

In the complete line, there are compounds for fast cutting... finer finishes... tight tolerances... for steel, brass, aluminum, zinc, lead and various alloys... for hard water or soft. Ask Oakite which is the *right* one to help you get the most from *your* barrel. Bulletin F-9339 tells more. Write Oakite Products, Inc., 18 Rector Street, New York 6, N. Y.

it PAYS to ask Oakite

OAKITE

over 50 *Est. 1909* SCIENCE

years' leadership in industrial cleaning

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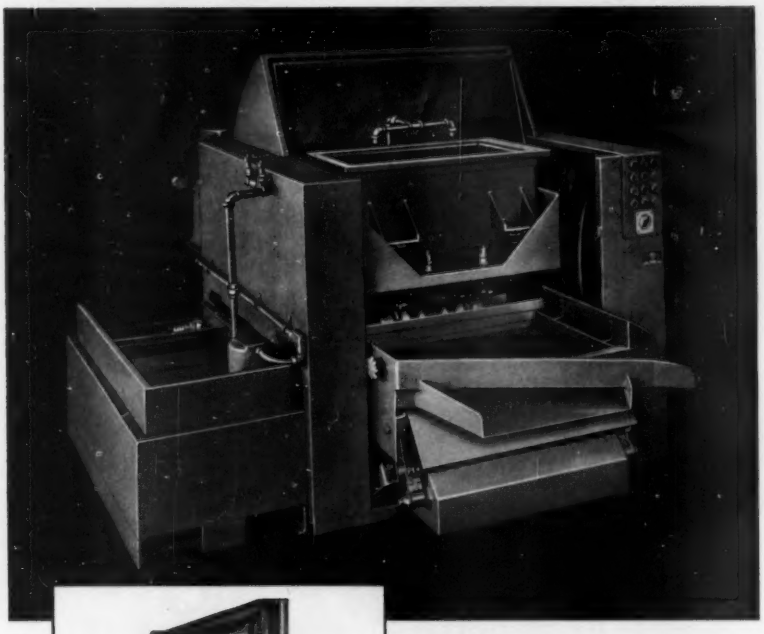
announcing the NEW

*Recirculating VIBRATRON



Processed in *Recirculating* Vibratron. Gleaming! Clean!

Processed in conventional vibratory machine. Notice abrasive impregnation.

See the difference Recirculation makes!

This new idea in vibratory finishing pays off in increased production and operating economy. Wastes are removed constantly during the processing cycle, *eliminating* abrasive impregnation! Compound stays clean.

Parts may be deburred, radiused, and cleaned *in one operation.* No separate cleaning cycle needed! Equally important . . . compound can be used for its effective life, lasts up to 48 hours.

The result? The unretouched parts photo tells the story. Both were vibratory finished the same time in the same media. The top in a recirculating Vibratron. The bottom in a conventional vibratory machine.

Want to know more? Your inquiry will receive prompt attention. Let's hear from you. Today?

ROTO-FINISH RANSOHOFF

3716 Milham Rd. • Kalamazoo, Mich. • Phone: Fireside 3-5578

**U.S. and foreign patents applied for.*

FOREIGN REPRESENTATIVES: ARGENTINA-Roto-Finish Argentina-Buenos Aires • AUSTRALIA-A. Flavell Ltd.-Cheltenham • BRAZIL-Refema-Roto-Finish-Sao Paulo • CANADA-Canadian Hansen & Van Winkle Co., Ltd.-Toronto • ENGLAND-Roto-Finish Ltd.-Hemel Hempstead • FRANCE-Societe Roto-Finish-Paris • GERMANY, AUSTRIA, FINLAND, NORWAY, SWEDEN, SWITZERLAND, YUGOSLAVIA, JAPAN-Metallgesellschaft A.G.-Frankfurt, a.m.-Germany • HOLLAND, BELGIUM, LUXEMBURG-N.V. Roto-Finish Maatschappij-Delft, Holland • ITALY-Societa Roto-Finish a R.L.-Milan • MEXICO-Enthone de Mexico, S.A. Prol Pino 669, Mexico 15, D.F. • SPAIN-Institute Electroquimico, S.A.-Barcelona

Circle No. 97 on Reader Service Card

INDUSTRY NEWS *(continued)*

WAIMET NAMES DVORAK

DVORAK

Appointment of Richard J. Dvorak as Sales Engineer for Wai-Met Alloys Company has been announced by Roger J. Metzler, Sales Manager.

In his new position Dvorak will handle sales and provide technical assistance on refractory materials being offered by WaiMet in addition to handling sales of specialized casting alloys.

ICI TO HOLD CLINIC

J. H. Cadieux, Chairman of the Investment Casting Institute's Clinic Committee announced that the next industry sponsored investment casting clinic will be held at the North Park Hotel in Chicago on November 1, 1960.

"If you are looking for a better method for producing your small components, then bring your metal fabrication problems to the Clinic," stated Cadieux.

The Chicago clinic will be a full day session featuring workshop discussions and special investment casting displays. During the workshops, participants will have an opportunity to discuss questions with qualified technical personnel from the investment casting industry. Workshops will be held on such topics as: "Designing for

Lowest Cost"; "Investment Casting Applications"; "The Economics of Tooling for Investment Castings"; "New Developments in Alloys for Investment Castings"; and "Recognizing Investment Casting Applications."

Hundreds of investment castings will be on display. In addition, a copy of the new investment casting book: "How to Design and Buy Investment Castings" will be presented to all who attend the Clinic. There will be a registration fee of $10.00 which includes luncheon.

MOORE APPOINTED

MOORE

Dr. Charles H. Moore, an expert in research organization, physical chemistry, and metal and metalloid product development, has been appointed technical director of the Copper Products Development Association, Inc.

Dr. Moore was formerly the executive director of corporate research and development and management of Semiconductor Operations for P. R. Mallory and Company, Inc.

As technical director of the Copper Products Development Association, Dr. Moore will head a broad program of research and development underwritten by copper producers of the free world to find new and improved uses for copper. This program, initiated earlier this year, already includes four major copper research studies under way at laboratories in this country and abroad. It is expected to be expanded as additional research projects aimed at improving the competitive position of copper in industrial and consumer markets are established.

MICRO METALS ELECTED TO M.P.I.F.

The Metal Powder Industries Federation announces the election of Micro Metals Corporation to associate membership in the Metal Powder Industries Federation.

Micro Metals Corp. located in Paterson, N.J. are conditioners and mechanical reducers of metal powders as well as sintered and green powder metallurgy parts.

Representing the company is Philip L. Bornstein, President.

PANGBORN APPOINTMENTS

Pangborn Corporation has announced the appointment of three process engineers, all specialists in vibratory finishing.

William E. Brandt, Jr. is assigned to the Hagerstown office, Barry L. Selack to Cleveland and John G. Weber to Milwaukee.

Their purpose is to assist and advise all companies on applications or problems in vibratory or precision barrel finishing.

more industry news next page

To make it travel better and handle easier our TADANAC Brand Special High Grade Zinc slab has been redesigned. End notches hold steel strapping securely so that bundles arrive in good shape. Handholds permit safe, easy handling of individual slabs. The top quality of TADANAC Brand S.H.G.(99.99+%) Zinc is now marketed in this new slab designed to save the customer time and money.

Remember, Cominco's Technical Service stands ready at all times to assist you to get the best value from your use of TADANAC Brand Zinc.

Buy TADANAC Brand Special High Grade Zinc for convenience, quality and service.

COMINCO

THE CONSOLIDATED MINING AND SMELTING COMPANY OF CANADA LIMITED
Toronto WORLD'S LARGEST LEAD-ZINC PRODUCER Montreal

Tadanac Brand Metals are sold in United States by American Metal Climax, Inc., New York, Chicago, Detroit, Los Angeles

Circle No. 17 on Reader Service Card

IBM *specified die casting*

...to save machining

How else could this International Business Machines part be made?

It could be milled, machined and bored. But costs would be exhorbitant. It could be cast by other methods. But accuracy and subsequent machining operations would be costly.

Look at the job! 12 cores, 10 slotted surfaces, planes on varying levels. Tolerances as exacting as ± .002, non-accumulative between holes and slots.

IBM desired to eliminate post-casting operations. Twin City Die Castings made die and castings to meet exacting requirements. Result: costs held, performance insured, the die casting process demonstrated its flexibility.

Perhaps die casting can pay you in precision, appearance, fewer assembly steps . . . by cutting your costs. Call or write. A Twin City Die Castings engineer can help die casting pay for you.

...only DIE CASTING can
✔ cut your costs ✔ offer such flexibility
✔ provide such accuracy

Leading Die Casters in the Upper Midwest

TWIN CITY DIE CASTINGS CO.

3351 TALMADGE AVE. S. E. • MINNEAPOLIS 14, MINN. • PHONE MI 6-7528

Circle No. 94 on Reader Service Card

INDUSTRY NEWS *continued*

LATROBE STEEL APPOINTS SCHOBER

SCHOBER

Marshall Schober, manager of marketing for Latrobe Steel Company, has been named assistant to the president.

Schober, a graduate of Massachusetts Institute of Technology (1945), joined the company in 1950 at its Philadelphia sales office.

NORWALK APPOINTS JAMISON

JAMISON

The appointment of Roy S. Jamison as Vice President of Norwalk Powdered Metals, Inc. was announced by André Blumenthal, President. Mr. Jamison will be in charge of the manufacturing and engineering divisions. He is a graduate of The Carnegie Institute of Technology.

Mr. Jamison has been associated with the powder metal industry for many years, first as a process engineer with Moraine Products, and for the past seven years as technical sales engineer and sales engineering manager of the Hoeganaes Sponge Iron Corp.

more industry news on page 80

INVESTMENT CASTINGS

small
or
large

in any metal--ferrous, including magnesium
in any quantity--production or prototype

Arwood's casting facilities enable us to cast parts that range from a fraction of an ounce up to 100 pounds. You now have a single source for small and large castings. It's just another good reason for doing business with Arwood.

- Five production plants throughout the country.
- Complete design, tooling and metallurgical research facilities.
- Eighteen years' experience in casting *all* the metals and alloys that can be poured into a mold – including everything from magnesium right through to stainless steel and difficult-to-machine superalloys.
- A time-tested record for reliability in meeting quoted prices and scheduled deliveries.
- Seventy-one trained engineering representatives coast to coast.

So . . . when the specifications call for an investment casting, you'll find that it pays to get a quote from Arwood.

Like to know more about investment casting? Send for our 44-page "Practical Guide to Investment Casting." It's yours for the asking.

Machine the simple . . . cast the complex

A complete service from design through tooling, production and finish machining. Seventy-one engineering representatives from coast to coast.

arwood

ARWOOD CORPORATION • 323 West 44th Street, New York 36, New York

PLANTS IN BROOKLYN, N. Y.; TILTON, N. H.; GROTON, CONN.; LOS ANGELES AND LA VERNE, CALIF.

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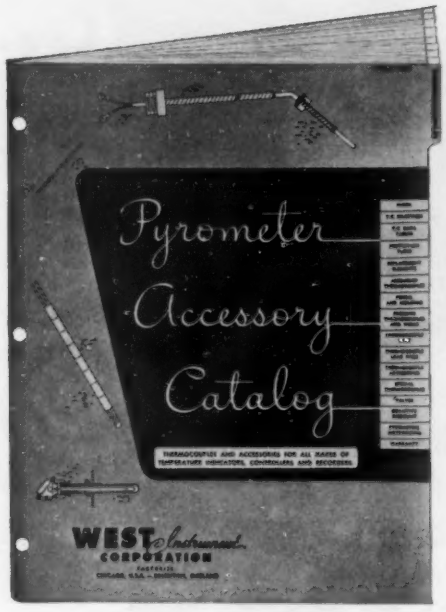
If you use
THERMOCOUPLES
call for
WEST



For *all* applications—for use with all standard types of temperature indicators, controllers, recorders—we make a complete selection of thermocouples from matched and checked wires, assuring constant millivolt output for accurate readings.

NEW DATA BOOK FREE

Revised 40-page file-size catalog

- Lists all data (I.S.A. standards), components and prices
- Graphically shows how to select best thermocouple and protective tube for each operation

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4357D W. MONTROSE, CHICAGO 41, ILL.
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Represented in Canada by Davis Automatic Controls, Ltd.

See us at the 15th Annual ISA Instrument-Automation Conference & Exhibit New York Coliseum Sept. 26-30, 1960 Booth 422

the trend is to WEST

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INDUSTRY NEWS *continued*

HAGANS ELECTED

HAGANS

J. D. Hagans has been elected President of the Alloy Casting Institute according to E. A. Schoefer, Executive Vice President. Hagans, Sales Manager of The Ohio Steel Foundry Co., succeeds J. B. Dear, Sales Manager of the Duraloy Co.

LINDSTROM APPOINTED

Leonard J. Lindstrom has been appointed manager of engineering and research of Despatch Oven Company.

In his new position Lindstrom will have responsibility for all engineering of the Despatch line of industrial furnaces, finish baking ovens, paint sprayers, metal cleaning equipment, foundry ovens, and chemical ovens. He will also head up engineering and research for the Despatch line of laboratory ovens, furnaces, and bakery ovens, reports A. T. Substad, general manager of the firm.

UNIVERSAL-CYCLOPS AWARDED NAVY CONTRACT

Universal-Cyclops Steel Corp. has been awarded a contract approximating a half million dollars by the Department of the Navy, Bureau of Naval Weapons. The contract covers process development in the production of molybdenum alloy sheet. Two alloys will be investigated, Molybdenum-0.5% Titanium and Molybdenum 0.5% Titanium-0.07% Zirconium.

Specifically, the program is designed to produce optimum conditions of isotrophy, homogeneity, and reproducibility. Variables to

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SAVE: TIME WORK DOLLARS

on your aluminum alloy casting operations with the

***Stahl* AUTOCAST**

Automatic Permanent Mold Casting Machine

• **PORTABLE...** Both machines can be moved as a unit to different furnaces for casting different alloys.

• **FAST...** Automatic Timer eliminates human error. Dies easily interchanged. Dies need less maintenance of refractory coating.

• **ACCURATE...** Timer has 3-second graduations from 0 to 5 minutes; counter records cycles to 9,999; jog buttons for "inching" mold in either direction.

We can adapt your molds to the AUTOCAST, or make new dies to your specifications.

Send for our technical brochure.

STAHL SPECIALTY CO.
KINGSVILLE, MISSOURI

be studied are: (a) singles versus double vacuum arc melting and (b) four methods of processing molybdenum ingot to plate. The four methods cover: 1. Extrusion of the alloys to rounds and then forging them to sheet bar; 2. Direct extrusion to sheet bar; 3. Extrusion in air with subsequent forging in InFab, the company's new facility for fabricating refractory metals in an inert atmosphere; and 4. Direct forging in InFab.

The product from each of the four methods studied will be evaluated to determine which yields the optimum properties for fabrication to sheet.

ALCOA INCREASES ALLOY STRENGTH

Aluminum Company of America has announced increases in minimum guaranteed tensile and yield strengths for extruded shapes in aircraft and missile alloy 7178-T6.

Chief advantage of the increase is that aircraft and missile designers now can take advantage of higher-strength extruded shapes.

more industry news on page 84

DELAWARE
Machinery *and* Tool Co., *Inc.*

WE DESIGN AND BUILD QUALITY DIE CAST DIES FROM SMALLEST UP TO 20 TONS

EXPERIENCE — Over 20 years experience in designing and building single and multiple cavity, aluminum and zinc die casting dies.

ENGINEERING — Staffed with design engineer specialists in die cast dies and moulds.

CALL OR WRITE TODAY for our services or complete 8-page brochure of equipment and facilities.

DELAWARE MACHINERY and TOOL CO., INC.
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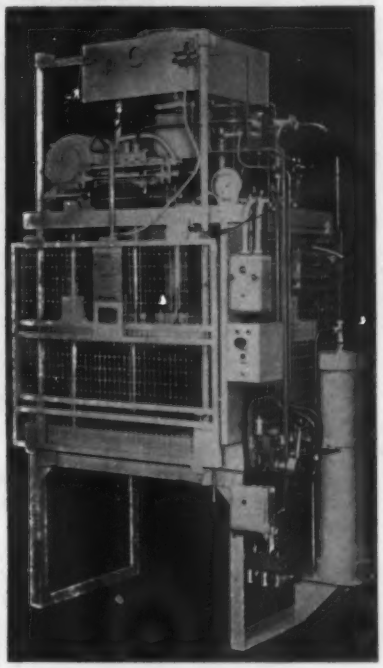
NEW BIPEL FAST-CYCLE HYDRAULIC CLIPPING PRESS



A brand new 34-ton clipping press from BIPEL... world renowned for their plastic molding presses! This special purpose hydraulic unit offers a faster approach (600 ins./min.), and a fast advance through the work (40 ins./min.), at full tonnage. Dry Cycle Time only 3 seconds. Semi-automatic or manual control... with mesh guards for maximum operator safety. A flexible, efficient, clean-trimming unit.

Write for Full Information

B.I.P. Engineering Ltd., Sutton Coldfield, England

RALPH B. SYMONS ASSOCIATES, INC.
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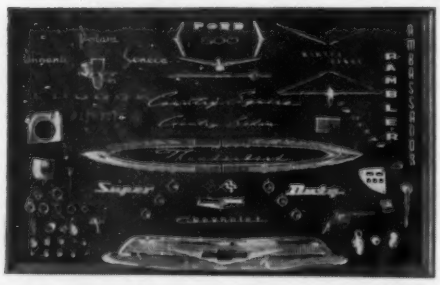
50 million castings a year

PUTTING THE NEW CARS IN TRIM FOR READY SALES

At the TRILEX CORPORATION, Wayne, Mich., this efficient battery of 14 KUX Hot Chamber Die Casting Machines (400- and 600-ton) is part of the complete Trilex facilities for modern die casting, fully automatic plating, finishing, and assembling.



from these KUX die casting machines

"THE PRIMARY concern of the major automobile manufacturers for die-cast trim parts is *quality*," says John Airey, president of Trilex Corporation, important suppliers in the automotive and appliance field. "That's why we have use KUX Die Casting Machines since 1945. They produce hardware finish quality castings.

"But along with quality," Mr. Airey continues, "auto makers as well as appliance men consider *price*. We've found that KUX machines can be depended on for minimum maintenance and minimum downtime. They put us in a better position to compete on a cost-per-unit basis."

Whether your main concern is lower production costs, higher quality or both, investigate the advantages of KUX Die Casting Machines. 28 all-new strain gauge proven KUX models, 50 to 2000 tons, for both hot or cold chamber operation, available with automatic cycling mechanism and KUX patented "Vac-U-Die" and "Auto Feed" systems of vacuum die casting.

Write for full details of the 28 all-new KUX models illustrated in the latest KUX Die Casting Machine Catalog.

KUX MACHINE CO.

6725 North Ridge Avenue, Chicago 26, Illinois

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2	20	38	56	74	92	110	128	146	164	182	200	218	236	254	272	290	308	326	344	362	380	398
3	21	39	57	75	93	111	129	147	165	183	201	219	237	255	273	291	309	327	345	363	381	399
4	22	40	58	76	94	112	130	148	166	184	202	220	238	256	274	292	310	328	346	364	382	400
5	23	41	59	77	95	113	131	149	167	185	203	221	239	257	275	293	311	329	347	365	383	401
6	24	42	60	78	96	114	132	150	168	186	204	222	240	258	276	294	312	330	348	366	384	402
7	25	43	61	79	97	115	133	151	169	187	205	223	241	259	277	295	313	331	349	367	385	403
8	26	44	62	80	98	116	134	152	170	188	206	224	242	260	278	296	314	332	350	368	386	404
9	27	45	63	81	99	117	135	153	171	189	207	225	243	261	279	297	315	333	351	369	387	405
10	28	46	64	82	100	118	136	154	172	190	208	226	244	262	280	298	316	334	352	370	388	406
11	29	47	65	83	101	119	137	155	173	191	209	227	245	263	281	299	317	335	353	371	389	407
12	30	48	66	84	102	120	138	156	174	192	210	228	246	264	282	300	318	336	354	372	390	408
13	31	49	67	85	103	121	139	157	175	193	211	229	247	265	283	301	319	337	355	373	391	409
14	32	50	68	86	104	122	140	158	176	194	212	230	248	266	284	302	320	338	356	374	392	410
15	33	51	69	87	105	123	141	159	177	195	213	231	249	267	285	303	321	339	357	375	393	411
16	34	52	70	88	106	124	142	160	178	196	214	232	250	268	286	304	322	340	358	376	394	412
17	35	53	71	89	107	125	143	161	179	197	215	233	251	269	287	305	323	341	359	377	395	413
18	36	54	72	90	108	126	144	162	180	198	216	234	252	270	288	306	324	342	360	378	396	414

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15	33	51	69	87	105	123	141	159	177	195	213	231	249	267	285	303	321	339	357	375	393	411
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18	36	54	72	90	108	126	144	162	180	198	216	234	252	270	288	306	324	342	360	378	396	414

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- ☐ None of these

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DATA OFFERED IN THIS MONTH'S ADS

Qualified readers may obtain any of these free reference materials by circling the numbers on the Reader Service Cards facing page 82

1. **Die Lubricant**—Acheson Colloids Co.—Technical bulletin—on semi-colloidal and colloidal dispersions for dies and other abrasive, high temperature and pressure uses.
2. **Die Castings**—Advance Tool & Die Casting Co.—Facilities brochure—shows the equipment and services available for zinc and aluminum die casting.
5. **Tool Steels**—Allegheny Ludlum Steel Corp.—Booklet—describes the Steelector method for selecting the tool steel that meets your particular requirements.
9. **Die Castings**—American Smelting & Ref. Co.—Technical information—on electrolytically refined high grade zinc and other alloys for die casting.
12. **Investment Casting**—Arwood Corp.—44-page booklet—"Practical Guide to Investment Casting."
13. **Die Casting Machines**—B & T Machinery Co.—Information—on a line of zinc and aluminum die casting machines for producing fine-finish, high-density castings in volume quantities.
15. **Clipping Press**—B. I. P. Engineering Ltd.—Technical data—on a 34-ton, fast cycle, hydraulic clipping press.
16. **Die Casting Machine**—Cleveland Automatic Machine Co.—Specifications—on a 100-ton die casting machine with many unique design features.
18. **Die Casting Dies**—Crucible Steel Co. of America—Technical data—on CSM 2 steel which eliminates the heat treatment of most zinc die casting dies because of its uniform hardness.
19. **Crucibles**—Denver Fire Clay Co.—Catalog—gives full information on a line of crucibles and funnels for the casting industry.
20. **Standard Unit Dies**—Detroit Mold Engineering Co.—Production information—tells how to make die changes in minutes with standard unit dies.
22. **Crucibles**—Joseph Dixon Crucible Co.—Specifications—and other information on crucibles and refractories.
24. **Die Castings**—Dollin Corp.—16-page facilities brochure—describes and illustrates die casting services, facilities and equipment.
25. **Cutting Fluid**—Fiske Bros. Refining Co.—Technical data—on Fibrecool, a water soluble cutting fluid.
27. **Tiny Zinc Die Castings**—Gries Reproducer Corp.—Bulletin—describes the Intercast method of making small die castings with moving elements in one operation.
28. **Castings**—Hampden Brass & Aluminum Co.—Brochure—shows equipment and facilities for permanent mold and die casting.
29. **Zinc Alloys**—Henning Bros. & Smith—Reference book—and guide to the selection of zinc base die casting alloys.
31. **Investment Casting**—Hitchiner Mfg. Co.—13-page booklet—explains the ceramic shell investment casting process and shows Hitchiner's facilities.
34. **Fire-Resistant Fluids**—E.F.Houghton & Co.—48-page handbook—guides your selection and application of fire-resistant hydraulic fluids and compatible packings.
39. **Furnaces**—J. A. Kozma Co.—Specifications—on radiant fired breakdown and holding furnaces.
40. **Die Casting Machines**—Kux Machines Co.—Catalog—describes a line of 28 die casting machines from 50 to 2000 tons.
42. **Die Casting Machines**—Lester-Phoenix, Inc.—Bulletin—gives complete specifications on die casting machines with locking pressures of 100 to 1600 tons.
43. **Induction Heating**—Lepel High Frequency Laboratories, Inc.—Catalog—describes a line of high frequency induction heating equipment.
52. **Sinterings**—New Jersey Zinc Co.—Technical booklet—"Designing for Pressed Brass and Nickel Silver Metal Powder Parts."
53. **Sintering Furnace**—Kinney Div., New York Air Brake Co.—Technical bulletin—on a high vacuum sintering furnace for laboratory and production use.
54. **Die Castings**—Paramount Die Casting Co.—Design booklet—tells how to design die castings.
55. **Trim Presses**—Hannifin Company—Bulletin—describes high speed, hydraulic trimming presses.
56. **Mold Lubrication**—Pierce-Waller Inc.—Data sheet—on the Air-Lube system for cleaning and lubricating mold surfaces.
58. **Sinterings**—Reese Metal Products Corp.—16-page booklet—tells how to cut precision parts costs with Remet powdered metal process.
59. **Iron Powder**—Republic Steel—Technical booklet—contains detailed engineering data and test evaluations on MHS 6450 alloy powder.
60. **Casting Aluminum**—Reynolds Aluminum—128-page technical manual—answers your questions on casting aluminum.
62. **Die Casting Dies**—Richards Tool & Mold Co.—Information—on how their Master-Molds eliminate expensive die sets and other costs.
66. **Ladles**—Spincraft, Inc.—Data and prices—on stainless steel ladles of non-spill design which are 75% lighter than cast iron models.
67. **Automatic Casting Machine**—Stahl Specialty Co.—Technical bulletin—describes the Stahl Autocast automatic machine for permanent mold casting in aluminum.
68. **Compacting Presses**—F. J. Stokes Corp.—Data sheet—on single-station, multiple motion compacting presses with secondary lower motion.
71. **Fire-Resistant Fluids**—Union Carbide Chemicals Co.—Booklet—"UCON Hydrolubes Spell Safety," tells how to protect your plant with fire-resistant fluids.
73. **Thermocouples**—West Instrument Corp.—40-page catalog—lists prices and data on pyrometer accessories, shows how to select the best thermocouple and protective tube for each operation.
74. **Nickel Plating**—American Smelting & Refining Co.—Information—on how the Levelmax process produces a bright nickel coating on unbuffed castings.
76. **Barrel Finishing Media**—Minnesota Mining & Mfg. Co.—Booklet—"There's Gold in Them Thar Barrels" describes Honite barrel finishing media.
77. **Barrel Finishing Media**—Oakite Products, Inc.—Technical bulletin—tells how "Media-matched" compounds offer extra barrel finishing economies.
78. **Spray Painting**—Ransburg Electro-Coating Corp.—Literature—on Electrostatic spray painting that saves paint and labor, improves work quality.
91. **Piston Rings**—Auto-Diesel Piston Ring Co.—Catalog—lists plunger rings, tips, liners and combination tip-Rings.

continued on next page

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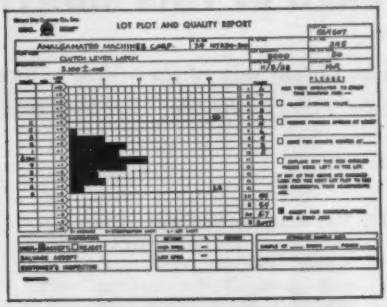

Here's what the new concept of Quality Control at Stroh Die Casting means to you

CRITICAL DIMENSIONS
can be held within specified limits. Buyers who rely on statistical dimensioning to assure accurate parts for assembly are invited to consult Stroh.

LOWER INSPECTION COSTS
come from simpler receiving inspection instead of full sampling of each shipment of die castings. Many manufacturers now benefit from Stroh's Quality Control.

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IN OUR 56th YEAR

Stroh Die Casting Co., Inc.

11123 WEST BURLEIGH STREET
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reduce operator fatigue

Spincraft

ladles handle easily, last extra long

Light and easy in the hand, yet tough enough to stay in action long after cast iron ladles burn out.

NON SPILL SHAPE ELIMINATES WASTE!
75% LIGHTER THAN CAST IRON LADLES!
Available in all sizes, stainless and mild steel.

WRITE TODAY FOR COMPLETE DATA AND PRICES.

Spincraft
SKILL WILL DO IT

4140 West State Street
Milwaukee 8, Wisconsin
Division 2-0730

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DATA IN ADS *continued*

92. Metal Finishing—Almco Queen Products Div.—Literature—describes the latest metal finishing machines, methods, and media.

93. Dip-Out Furnaces—International Foundry Supply Co.—20 page brochure describes Reverbale continuous melting and holding dip-out furnaces.

96. Extrusion Tool Steels—Latrobe Steel Co.—Technical data—on a line of steels for extrusion dies.

100. Dies & Molds—Delaware Machinery and Tool Co.—8-page brochure shows equipment and facilities for making die casting dies and molds.

101. Electric Furnace—Hevi-Duty Electric Co.—Bulletin—describes an electric crucible furnace of circular design with three dip-out stations.

102. Dry Hearth Furnace—Hevi-Duty Electric Co.—Bulletin—describes a dry hearth furnace with thermocouple control.

104. Pattern Wax—Alexander Saunders & Co.—Graph—shows the expansion and cooling curves for a tough, durable pattern wax with a low coefficient of expansion.

INDUSTRY NEWS *continued*

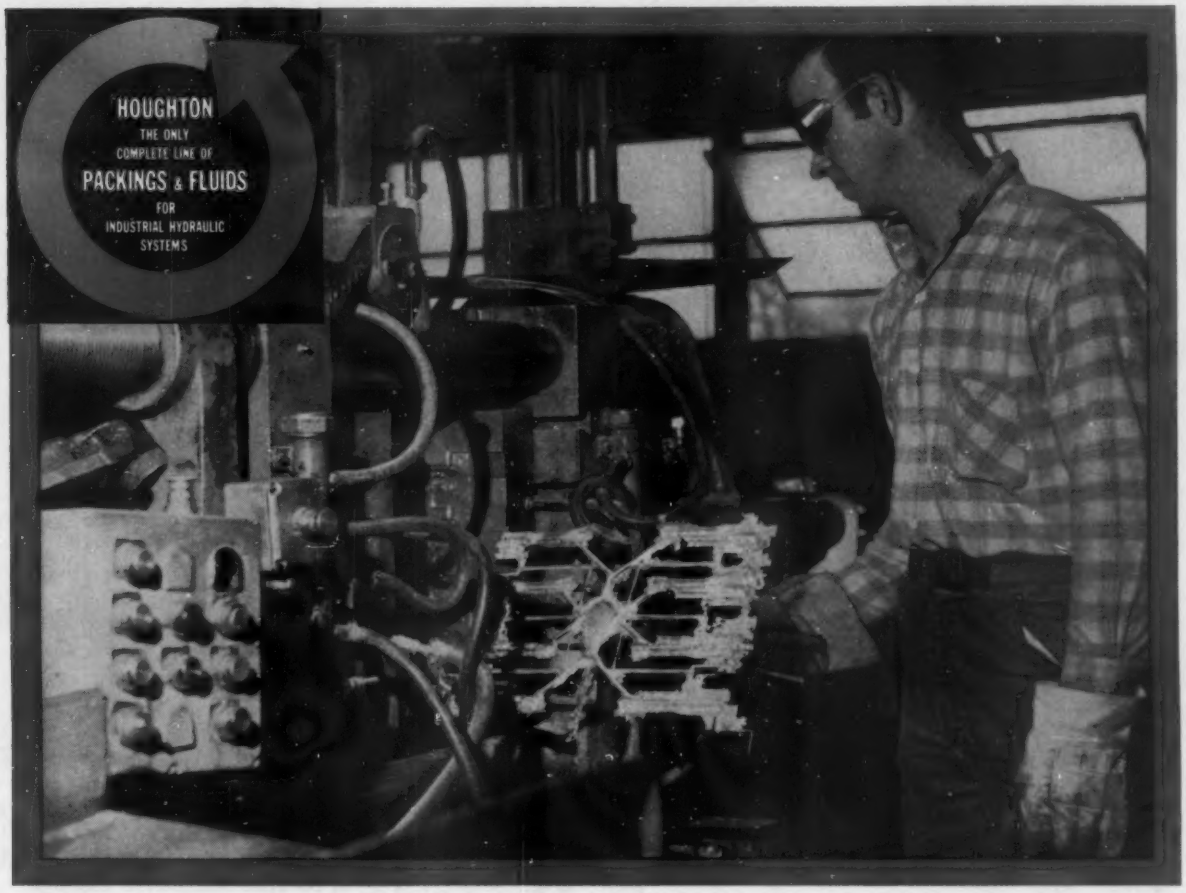
NEW JERSEY ZINC NAMES J. ALEXANDER

ALEXANDER

The New Jersey Zinc Company has announced the election of James R. Alexander as Vice President. He will be in charge of the sale of the Company's products, succeeding Robert G. Kenly who will assume new administrative duties.

Formerly vice president-sales of H. K. Porter Company, Inc., Thermoid Division, Alexander has worked in sales over 20 years.

more industry news on page 86



SIX YEARS WITHOUT DRAINING . . .
a lesson in safe hydraulic fluid economy

Since 1954, four 400-ton die casting machines like this one operated continuously on *their initial fill* of Houghto-Safe Hydraulic Fluids. Only make-up was needed to maintain proper fluid level. And each machine operated more than 3000 hours every year.

What better example of the important *extras* you get in *fortified* Houghton Fire Resistant Fluids? In addition to fire-safety, the built-in lubricity, oxidation stability, and corrosion resistant characteristics of Houghto-Safe fluids kept machine maintenance costs to a minimum. Performance was comparable to that of the finest petroleum oils . . . with the added advantage of fire-safety.

Houghto-Safe *fortified* fluids can give your hydraulic equipment and plants this same economical protection. And with it you get completely unbiased hydraulic service from the only manufacturer who offers three types of fire-resistant fluids (Water-Glycol, Phosphate-Ester and Emulsion Types) with compatible packings for any industrial hydraulic service.

FREE! 48-page Handbook of authoritative and helpful information on selection and application of fire-resistant hydraulic fluids and compatible packings. Write E. F. Houghton & Co., 303 W. Lehigh Ave., Phila. 33, Pa.

Industry's Partner in Production

E. F. HOUGHTON & CO.

Philadelphia, Pa. • Chicago, Ill. • Carrollton, Ga. Detroit, Mich. • San Francisco, Calif. • Toronto, Canada

Circle No. 34 on Reader Service Card

APEX NAMES CAULTON

Chicago – Apex Smelting Company has announced the appointment of Richard G. Caulton as Eastern Sales Manager, located at the Cleveland, Ohio plant. Mr. Caulton has twenty years experience in aluminum and zinc alloy sales and service in the midwest and more recently as a Sales Engineer for Apex in the eastern area.

Donald L. Colwell, Vice President in Charge of Laboratories, who has been functioning as Sales Manager at the Cleveland office during the last two years, will now devote his full time to research and development work.

STEWART APPOINTED

Universal-Cyclops Steel Corporation announced the appointment of John L. Stewart as General Sales Manager. Stewart, who started with the Company as a sales trainee in 1946, has been District Sales Manager in Chicago.

BDC

THE ACCEPTED STANDARD IN THE MIDWEST

FOR QUALITY, SERVICE AND COST

for

Experience. *Our expert engineers, designers and production men know how to save you money while turning out top quality die castings.*

Modern Facilities. *Modern tool room and die casting equipment are at your service when you buy from Badger.*

Service. *Speed, dependability and cooperation are keynotes in our customer relationships.*

Engineering Help. *The advice and assistance of our engineers can save you time and dollars in designing your castings.*

Reasonable Prices. *You'll find Badger die castings fairly priced.*

Badger Die Casting Corporation

201 W. OKLAHOMA AVE., MILWAUKEE 7, WISCONSIN

Circle No. 14 on Reader Service Card

HINKLEY PURCHASES SPEED-D-BURR

HINKLEY

Forrest F. Hinkley, for the past 14 years with Aeroquip's Western Division, recently resigned as Vice President and General Manager. He has purchased the Speed-D-Burr Corporation, where he will serve as President and General Manager.

WAIMET OFFERS CONSULTATION SERVICE

WaiMet Alloys Company is now offering to investment casters a free consultation service on 17-4PH alloy heat treating methods to produce acceptable castings.

Improperly controlled homogenization heat treatment in the 2000°F range of 17-4PH alloy completely changes surface composition and properties of castings made from this alloy.

WaiMet will also help casters set up the necessary protective controls when 17-4PH alloy castings require homogenization heat treatment prior to solution annealing and hardening.

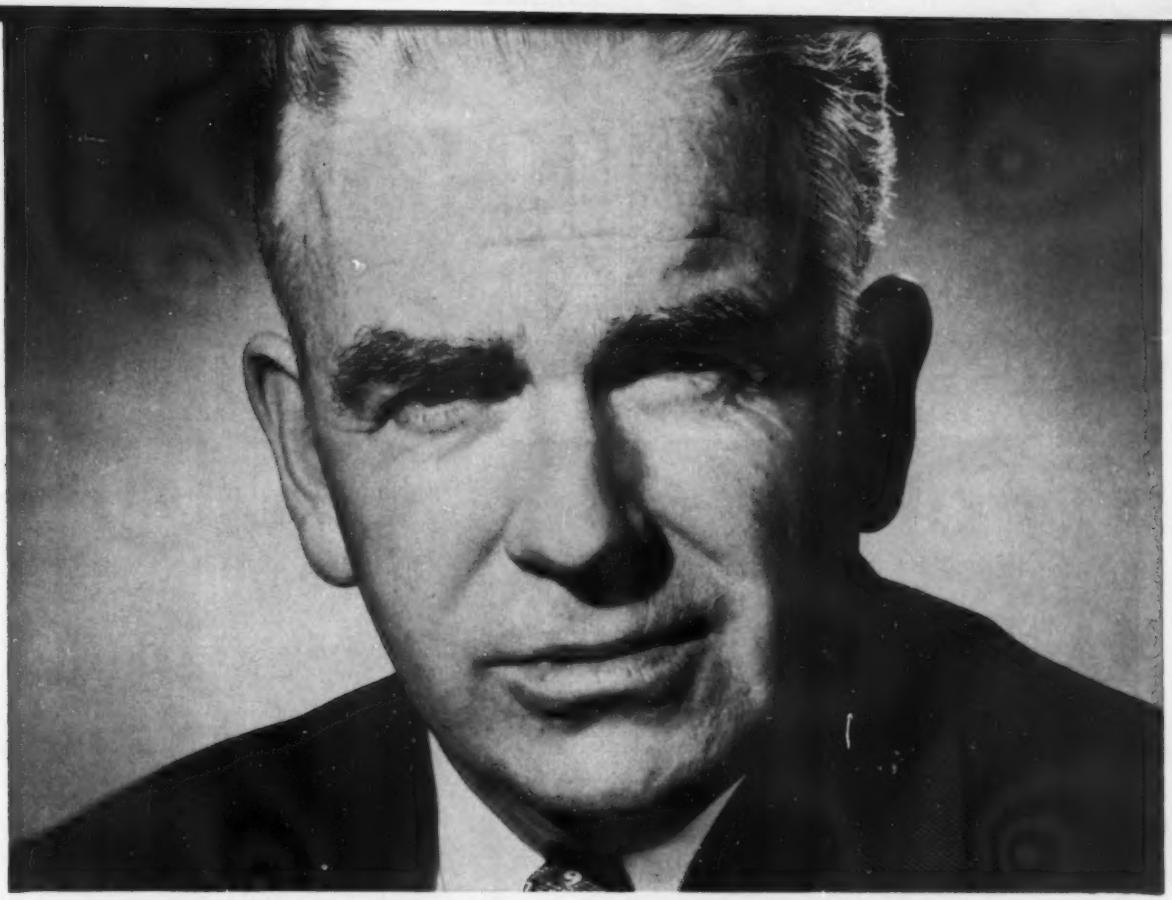
NEW JERSEY OPENS SOUTHERN OFFICE

To provide improved service to its customers in the South, The New Jersey Zinc Company has established a district sales office in Atlanta.

Robert W. Munson will be in charge as Southern District Sales Manager. Andrew G. McFadden also will have his headquarters in Atlanta.

Harold Hedden of Coral Gables, Florida, will continue to act as consultant to accounts in the southern Florida area.

more industry news on page 88



My answer for fire-resistant fluids is... UCON Hydrolubes

Q. WHY DO YOU NEED A FIRE-RESISTANT FLUID?

Hydraulic line failures never give warning! Without safety-fluids—you can have a disastrous fire. Even if insurance adequately covers the physical loss of buildings and equipment, even if you carry business interruption insurance . . . a fire can put you out of business or so cripple you that an entirely new start with new customers will have to be made.

But more important, a fire, especially one where burning oil is spraying around a building, can mean serious injury to your personnel. *It's a risk that an employer cannot afford to take.*

- UCON hydrolubes are the economical answer to fire-resistance in hydraulic fluids. Extensive field tests and more than 10 years of routine use in industrial hydraulic equipment have proven the safety and economy of UCON hydrolubes. And, UCON hydrolubes are approved for use by Factory Mutual Laboratories.
- UCON hydrolubes have outstanding anti-corrosion and anti-wear characteristics. Thus, pump replacement costs are held to a minimum.
- Conversion to fire-resistant UCON hydrolubes is quick and easy. Standard flushing and refilling procedures, involving a minimum of time and effort are sufficient.
- And once installed, UCON hydrolubes have low loss.

Remember—UCON hydrolubes are the economical answer for fire-resistance in hydraulic fluids. Replacement is quick and easy, and losses are low.

Get all the facts on UCON hydrolubes in the booklet, "UCON Hydrolubes Spell Safety." For a copy, ask a CARBIDE Technical Representative; or write Union Carbide Chemicals Company, Division of Union Carbide Corporation, Department J1, 270 Park Avenue, New York 17, N.Y.

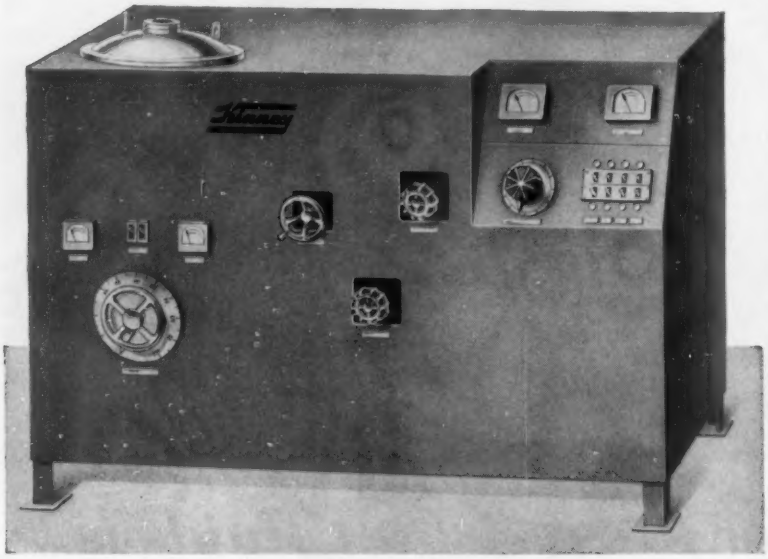
UNION CARBIDE and UCON are registered trade marks.

UNION CARBIDE CHEMICALS COMPANY

UNION CARBIDE

Circle No. 71 on Reader Service Card

VACUUM SINTERING



TEMPERATURES TO 2200° C · · · PRESSURES TO .01 MICRON

Kinney®

SINTERING FURNACE

For production as well as laboratory use in such operations as: the production of refractory metals through hydride decomposition, sintering of Tantalum anodes and high temperature ceramic reactions. This KINNEY High Vacuum Furnace fulfills the needs of applications where very low pressures and residual atmosphere of high purity are required. Write for full information on this and other new developments in KINNEY High Vacuum Furnaces.

KINNEY VACUUM DIVISION
THE NEW YORK AIR BRAKE COMPANY
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WRITE: for Bulletin No. 4510 Describing New Developments in Kinney High Vacuum Furnaces.

Please send me Bulletin No. 4510 and full information on KINNEY Sintering Furnaces.

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Company_____

Address_____

City_____ Zone____ State_____

Circle No. 53 on Reader Service Card

INDUSTRY NEWS *continued*

MAGNESIUM ASSOCIATION MEETS IN CLEVELAND

Theme of the 16th Annual Convention of The Magnesium Association has been announced as "Blueprint for Magnesium." The Convention, October 17, 18 and 19, will be headquartered at the Pick-Carter Hotel in Cleveland.

When announcing selection of this theme, Otis Grant, president of The Magnesium Association, said "All of the twenty-odd papers to be presented are concerned with those applications of magnesium which hold the greatest promise as major potential markets in the next few years."

Technical sessions of the convention, are open to all who are interested in magnesium applications and techniques. Scheduled speakers include engineering and manufacturing representatives of: Chevrolet Motor Div., General Motors Corp.; Materials and Space Vehicle Dept., General Electric Company; Tote Systems Inc.; Chem-Mill Div., Turco Products Corporation; Magnesium Elektron Ltd.; Missiles and Space Div., Lockheed Aircraft Company; Zero Manufacturing Company; The Martin Company; H & S Metal Products Company; Sylvania Electric Products Inc.; Grumman Aircraft Engineering Corporation; Marquardt Aircraft Corporation; Raytheon Corporation; Dow Metal Products Company; A-C Sparkplug Div., General Motors Corporation; Hughes Aircraft Company. In addition there will be a series of clinics discussing manufacturing problems and techniques.

Detailed programs are available from Jerry Singleton, executive secretary, The Magnesium Association, 122 East 42nd Street, New York 17, New York.

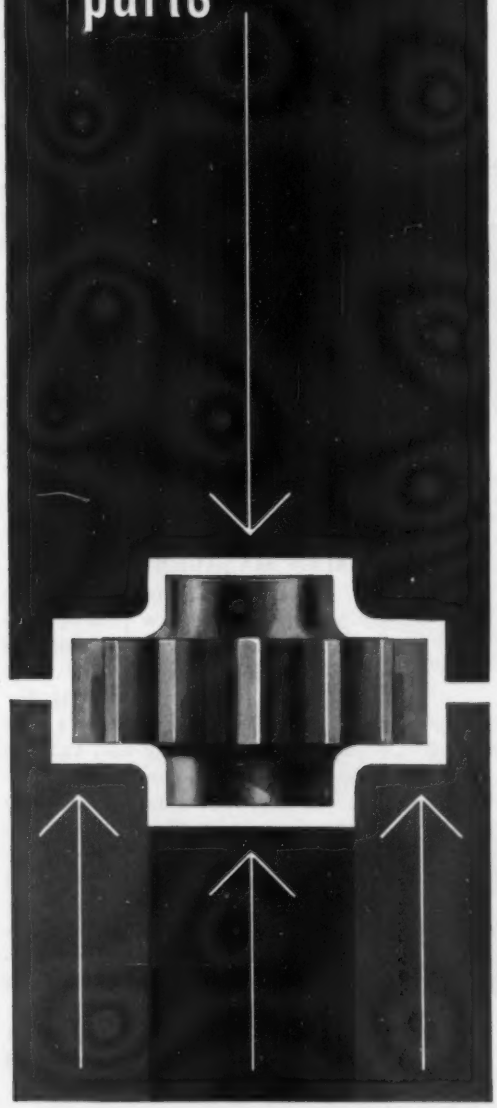
FIRM CHANGES NAME

The United States Bronze Powder Works, Inc. has changed their name to United States Bronze Powders Incorporated.

T. J. Mullen, Sr., who formerly was President, has been elected Chairman of the Board of Directors. S. V. Wilson has been named President.

more industry news on page 90

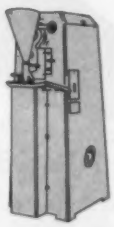
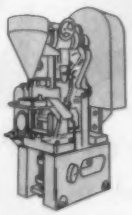
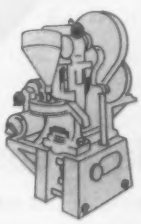
EXTRA MOTION for complex powder metal parts



Stokes answers the growing need for extra motions in the manufacture of more complex parts by adding three *new* machines to its extensive line of compacting presses. In each compacting press, the design of the secondary lower motion enables the operator to adjust timing, duration, and length of thrust independent of the mechanical timing of the pre-set main operating cycle of the press. The built-in secondary lower motions may be used as compacting punches or core-rods (stationary, movable, stripping, or ejection type).

These low and medium-pressure presses give you all the advantages you would expect to find in a Stokes press . . . accuracy, high production rates, ease of adjustment, and little maintenance . . . *plus extremely flexible lower motions.*

SINGLE-STATION MULTIPLE MOTION PRESSES

Model 572-1	Model 573-1	Model 574-1
4 TONS	12 TONS	20 TONS
		
4 TONS + 1 TON	12 TONS + 3 TONS	20 TONS + 5 TONS

For complete technical data on these single-station multiple motion presses, write for Data Sheet 126. Consult Stokes Engineering Advisory Service for complete technical assistance in designing parts, punches and dies, or complete production facilities.

STOKES

POWDER METAL PRESS DIVISION • **F. J. STOKES CORPORATION** • 5500 TABOR ROAD, PHILADELPHIA 20, PA.

Circle No. 68 on Reader Service Card

STOKES EXPANDS CHICAGO SALES OFFICE

F. J. Stokes Corporation has announced the re-location of the Stokes Chicago Sales Office to larger quarters in the Lincoln Building.

Stewart Helliwell, Midwest Regional Manager, will be in charge of all Press Division applications; William Henneman will continue to supervise the sales of Stokes' high vacuum equipment.

The Chicago Sales Office expansion move includes additional staffing of well-trained Service Engineers to insure customers prompt, efficient installation and service.

ALLEN-STEVENS EXPANDS

Allen-Stevens Corp. has completed a new addition to its plant in Woodside, N.Y. This 20,000 sq. ft. addition is the sixth expansion in their 13-year history.

Among new facilities added is a mechanical laboratory. This laboratory will have an optical comparator, Rockwell hardness tester, tensile strength tester, and other precision instruments not usually found in die casting plants.

slash costs of hard-to-make parts

Have a list of alloy parts you're now using? And their cost? Willing to invest a stamp to cut these costs?

Using the "lost wax" process, we'll cast, in our modern plant, about any shape part you need—at a surprisingly low per unit cost.

Just send a sketch of each part to Westinghouse Electric Corporation, Metals Plant, Blairsville, Pa. If it's castable, we'll snap back with details on prototype or production quantities. Shell-mold and vacuum casting also available. J-05012

Westinghouse investment casting produced this circuit breaker trigger as a single piece. Elimination of machining and assembly time reduced production costs by 60%.

You can be sure . . . if it's

Westinghouse

Circle No. 90 on Reader Service Card

KAISER BUILDING GARY PLANT

Kaiser Aluminum & Chemical Corporation has begun construction of a plant in Gary, Ind., for the primary purpose of calcining petroleum coke. The coke is used in the manufacture of carbon electrodes for the reduction cells in the company's primary aluminum plants.

Construction will include installation of a 180-foot rotary kiln and related handling facilities, with a capacity for calcining approximately 120,000 tons of coke per year.

Investment in the plant will be approximately one-million dollars.

NEW EXTRUSION FACILITIES

New extrusion plant facilities of Fetter Brothers Aluminum Manufacturing Company are now in full operation, according to Charles D. Fetter, president.

The step completes a major expansion started by the building products firm last year when it acquired the buildings and property of the Jeffersonville Quartermaster Depot from the U.S. Government.

The facilities give the company 215,000 square feet of manufacturing space. Major items of equipment are a new 1,650-ton Sutton extrusion press and production handling and tooling equipment.

CARPENTER APPOINTED SALES MANAGER

William P. Carpenter has been appointed to the new post of sales manager of the Vacuum Furnace Division of Richard D. Brew and Company, Inc., Concord, N.H. He will spearhead the division's new long-range marketing and vacuum equipment development program.

The Vacuum Furnace Division manufactures standard and custom-designed high-temperature vacuum furnaces for both industrial and laboratory use. Two of Carpenter's immediate objectives are the establishment of regional sales representation organizations throughout the U.S., and the control of current sales activity in order to keep the division's backlog consistent with its new production facilities.

more industry news on page 98

IDRA

DIE CASTING MACHINES

COSTRUZIONI IDROMECCANICHE BRESCIANE

Model OL/V 275 tons

DIE CASTING MACHINES
WITH VERTICAL COLD CHAMBER
OL/V. RANGE
Locking pressure: 110 - 165 - 275 - 440 tons.

WE MANUFACTURE: DIE CASTING MACHINES WITH HORIZONTAL COLD CHAMBER, WITH HOT CHAMBER (FOR ZINC ALLOYS), WITH VERTICAL COLD CHAMBER, WATER HYDRAULIC DIE CASTING MACHINES

OL/V. RANGE

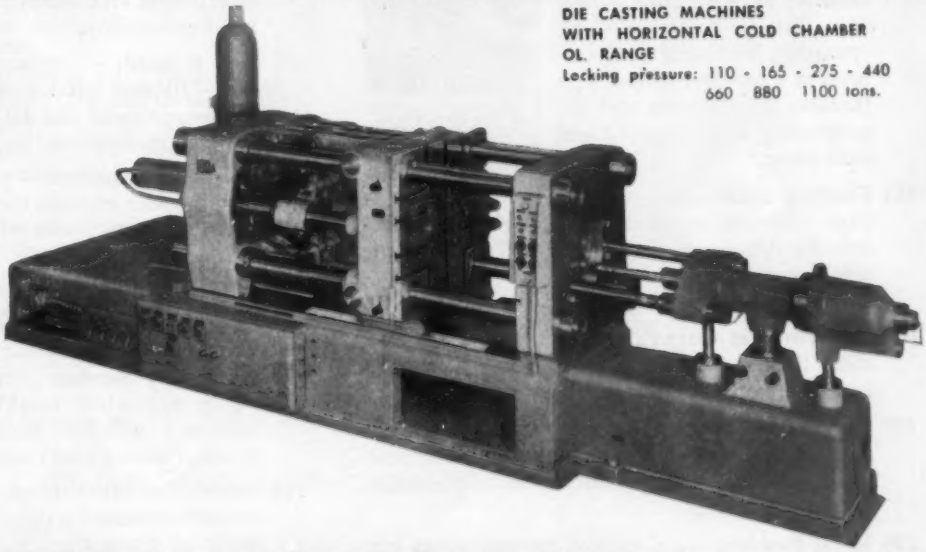
Locking force	Max. injection force	Dimensions of platens	Movable die platen stroke	Max. weight of castings (AL.)
110	17,6	20 3/16"x21 5/8"	9"	1,71
165	23	25 1/2" x25 1/2"	11 13/16"	2,86
275	38,5	31 7/8" x32 9/32"	14 3/4"	4,84
440	60,5	37 5/16"x37 5/16"	16 3/4"	16,28
tons.	tons.	inc.	inc.	lbs

OL. RANGE

Locking force	Max. injection force	Dimensions of platens	Movable die platen stroke	Max. weight of castings (AL.)
110	8,8	20 3/16"x21 5/8"	9"	2,64
165	16,5	25 1/2" x25 1/2"	11 13/16"	4,4
275	31	31 7/8" x32 9/32"	14 3/4"	6,6
440	44	37 5/16"x37 5/16"	16 3/4"	12,76
660	60,5	45" x45"	18 11/16"	17,6
880	82,5	51" x51"	20 5/8"	30,8
1100	88	57 1/2" x57 1/2"	23 5/8"	39,6
tons.	tons.	inc.	inc.	lbs

Model OL 440 tons

DIE CASTING MACHINES
WITH HORIZONTAL COLD CHAMBER
OL. RANGE
Locking pressure: 110 - 165 - 275 - 440 660 880 1100 tons.



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IDRA **BRESCIA (ITALY)**

VIA TRIUMPLINA 13 - PHONE 52.062 - 52.063
BRANCH OFFICE IN MILAN, VIALE PIAVE 5 - PHONE 798.289
CABLE: IDRA-BRESCIA (ITALY)

Circle No. 36 on Reader Service Card

USEFUL LITERATURE, CATALOGS, MANUALS

Qualified readers may obtain any of these technical publications by circling the numbers on the Reader Service Cards facing Page 82

PROCESSES

145 Die Castings — ADVANCE TOOL & DIE CASTING CO. — Facilities brochure shows the equipment and services for zinc and aluminum die casting.

146 Investment Casting — SHAW PROCESS DEVELOPMENT CORP. — 56-page booklet describes the Shaw Process for casting large parts with high strength and close tolerances.

147 Die Casting — ADVANCE PRESSURE CASTING CORP. — 16-page brochure includes design pointers, tables of zinc and aluminum die casting product standards, specification check list, and a facilities description.

148. Die Casting — REED-PRENTICE DIV. — 11-page technical paper describes a detailed engineering analysis of die casting variables.

149 Permanent Mold & Die Casting — PEASLEY PRODUCTS, INC. — Brochure shows how they provide low cost, high quality, zinc and aluminum permanent mold and die castings.

150 Sinterings — KEYSTONE CARBON CO. — Specifications and engineering data on ferrous and copper base powdered metal parts.

MATERIALS & EQUIPMENT

153 Sintering Furnace — HARPER ELECTRIC FURNACE CORP. — Bulletin lists engineering data, operating, and structural features of a new line of box type furnaces for sintering and impregnating iron, copper, and steel alloys.

154 Drafting Standards — THE ALUMINUM ASSOCIATION — 15-page supplement to "Drafting Standards for Aluminum Extruded and Tubular Products" has revised standard tolerances which supersede pages 16-44 of the Third Edition.

156 Iron Powders — METAL POWDERS INC. — Data sheet lists the applications for a line of sponge iron and iron alloy powders.

157 Sinterings — SOUTHWESTERN GRAPHITE CO. — Technical data sheet shows strength and hardness values obtained by graphite additions to copper and iron sinterings.

158 Metal Powders — U.S. BRONZE POWDER WORKS INC. — Technical data sheet lists the engineering properties of aluminum, brass, and copper powders.

159 Alloy Properties — HYMAN VIENER & SONS — Chart lists the physical properties of common metals, includes S.A.E. specifications for babbitt metals.

160 Steel Castings — LEBANON STEEL FOUNDRY — 5-page reference chart lists the mechanical properties, analyses, specifications, designations, and heat treatments for carbon, low alloy, and stainless steel castings.

161 Nickel-Chromium Alloy — HOSKINS MFG. CO. — 8-page technical bulletin on Chromel-AA, a new modified 80-20 nickel-chromium resistance alloy developed for use as heating elements in controlled atmosphere furnaces.

162 Stainless Steel Alloy — ALLOY CASTING INSTITUTE 6-page technical reprint on a high-strength, corrosion resistant, hardenable, cast stainless steel alloy.

163 Weight Calculator — UDDEHOLM CO. OF AMERICA, INC. — Slide-rule type weight calculator for strip steels relates length, width, thickness, and weight in metric and English systems.

164 Strength-Hardness Relations — BABCOCK & WILCOX CO. — Chart relates the tensile strength of steel to its hardness as measured by various testing systems.

165 Die Casting — ADVANCE PRODUCTS CORP. — Data sheets on shot sleeves, bushings, plunger tips, and die cooling water junctions.

166 Investments — RANSOM & RANDOLPH CO. — 14-page booklet gives data on the properties and use of investments and coatings for casting ferrous and non-ferrous alloys.

167 Dies & Molds — PEERLESS GEAR & MACHINE CO., INC. — 10-page catalog of pinions and racks for permanent mold and die casting dies includes tables of specifications.

168 Magnetic Inspection — MAGNAFLUX CORP. — 16-page booklet explains the basics of magnetic particle inspection, shows what equipment is needed.

169 Molds & Dies — DETROIT MOLD ENGINEERING CO. — 240-page catalog lists standard mold bases, mold making supplies, and other die and mold equipment.

170 Laboratory Services — CHARLES C. KAWIN CO. — 7-page technical booklet outlines engineering services available, including chemical analysis, physical testing, and consultation for the foundry.

171 Screw Threads — H. M. HARPER CO. — 16-page booklet explains the differences between the major kinds of screw threads, shows standard thread specifications and characteristics.

172 Compacting Presses — KUX MACHINE CO. — Complete information on a line of compacting presses with capacities of 10-500 tons.

continued on page 94

MISCO

CAPABILITY
RELIABILITY
REPRODUCIBILITY
proven

TEN MILLION TIMES!

Misco has produced 10,000,000 investment cast blades and vanes in support of gas turbine propulsive power in the MAJOR ENGINES of today's world – for AIRCRAFT, LAND vehicles, RAILROADS, and MARINE applications.

These blades and vanes have been produced for 100 CUSTOMERS, involving 67 DIFFERENT ENGINE APPLICATIONS and 1,000 DIFFERENT DESIGNS, processed with 40 DIFFERENT ALLOYS.

Misco processes meet the requirements of a variety of applications.

Whether you require hollow or solid components—produced under air, argon or vacuum-melt atmospheres – *whatever the shape or complexity* – you can place your CONFIDENCE in Misco.

Send us your inquiries, details of your requirements, or parts for quotation.

Misco Precision Casting Company

Plants in
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MUSKEGON, MICHIGAN

MISCO

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MONO-SHELL

Sales Offices in Principal Cities

PRODUCERS OF AIRCRAFT AND INDUSTRIAL INVESTMENT CASTINGS

V-V

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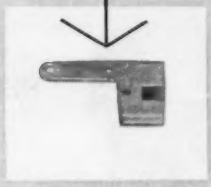
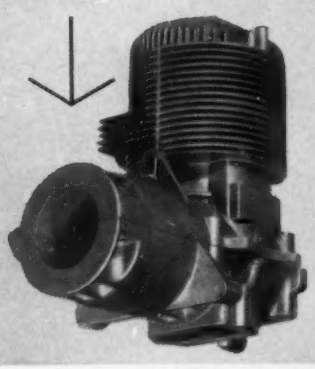
FROM
camera parts



TO
engine cylinders



ADVANCE designs and produces zinc and aluminum die casting components for manufacturers from coast-to-coast.

Whatever your zinc or aluminum die casting needs may be, ADVANCE has the creative engineering and production skill that improve product parts and lower costs.

It can pay you to write ADVANCE for a survey and cost estimate on that next die cast part.

These symbols are your assurance of highest quality control of zinc and aluminum alloys under ADCI standards.

38 years of service to industry.

ADVANCE TOOL AND DIE CASTING CO.

3780 N. Holton Street
Milwaukee 12, Wisconsin

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USEFUL LITERATURE *(continued)*

173 Extrusion Handling — CLARK AUTOMATION EQUIPMENT INC. — 18-page booklet gives details on automatic equipment for handling extrusions.

174 Heat Treating Furnace — DESPATCH OVEN CO. — Data and prices on a heat treating furnace for limited production and laboratory work.

175 Trimming Presses — KENCO MFG. CO. — Data on a line of 18-ton OBI presses of sturdy design.

176 Aluminum Window Specs — ALUMINUM WINDOW MFG. ASSOC. — 32-page book lists the master specifications for aluminum windows, including requirements for alloys, material thickness, fasteners, trim, and protective coatings.

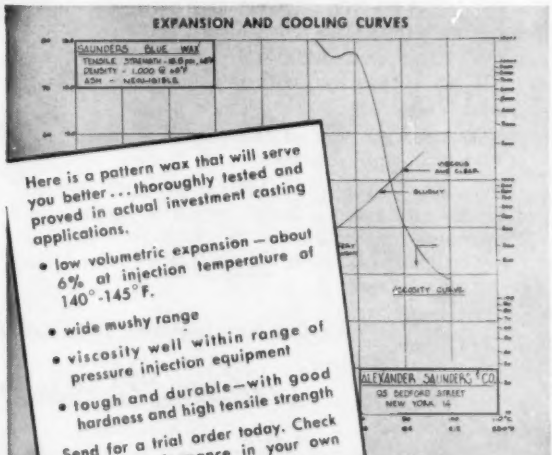
177 Gas Burner — RED-RAY MFG. CO. — Bulletin describes a high-radiation, type "H" gas burner able to put out 3,000 BTU per linear inch.

178 Aluminum Conductors — REYNOLDS METALS CO. — 7-page booklet lists the basic information on aluminum electrical conductors.

179 Pyrometers — LEEDS & NORTHRUP CO. — 6-page data sheet describes a line of Pyrometers, includes lists of accessories for sighting on small objects and other special applications.

180 Thermostat — BURLING INSTRUMENT CO. — Bulletin lists specifications on a small, differential expansion type thermostat having a range to 1150°F.

Saunders Blue Wax
...the pattern wax with good character-istics



Here is a pattern wax that will serve you better... thoroughly tested and proved in actual investment casting applications.

- low volumetric expansion — about 6% at injection temperature of 140°-145°F.
- wide mushy range
- viscosity well within range of pressure injection equipment
- tough and durable—with good hardness and high tensile strength

Send for a trial order today. Check its high performance in your own foundry.

A copy of this chart will be sent on request.

ALEXANDER SAUNDERS & CO., INC.
95 Bedford Street, New York 14, N. Y.

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1 Casting Process is Best For Your Specific Design...

Hampden Brass Offers 4 Different Methods To Choose From!

PERMANENT MOLD
Aluminum Alloys-High Purity Alloys

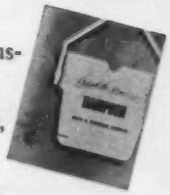
DIE CASTING
Aluminum Alloys-Zinc

SAND FOUNDRY
Aluminum Alloys-High Purity Alloys
Brass-Bronze-Monel

FIBERGLAS CASTING
High Quality Structural Fiberglas
Modern Vacuum Process

ONLY ONE IS BEST!
Let Hampden Brass's experts help you decide which process best suits your requirements . . . and help you produce a better product at lower cost!

Like to know more about Hampden Brass? Write for Illustrated Brochure, "Behind the Scenes" . . . a complete Digest of Hampden Brass's experience, equipment and facilities.



HB For Guaranteed Quality . . . Look to the Diamond of the Industry

Hampden Brass & Aluminum Company
Established 1903
SPRINGFIELD, MASSACHUSETTS

Complete Pattern, Machine, and Die Shops . . . X-Ray and Laboratory . . . Heat Treat and Wheelabrator facilities

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181 **Thermocouple Components** — MINNEAPOLIS-HONEYWELL REGULATOR CO. — 28-page catalog gives specifications and ordering information on replaceable components for thermocouple assemblies.

182 **Thermocouples** — WHEELCO INSTRUMENTS DIV. — Bulletin describes thermocouples for use in applications involving gases, oils, liquid oxygen, liquid metals, hydrogen peroxide, nuclear reactors, and melt furnaces.

FINISHING

190 **Color Decoration** — THE ACROMARK CO. — 4-page brochure tells how their color filling and parts printing machines give you custom-design function at stock-design cost.

191 **Painting Machine** — CONFORMING MATRIX CORP. — Brochure describes a portable, single spindle painting machine, completely air equipped and having an automatic timer.

192 **Vacuum Impregnation** — F. J. STOKES CORP. — 16-page booklet tells how vacuum impregnation improves the properties of castings, lists current applications, and describes a line of vacuum impregnation equipment.

193 **Barrel Finishing Units** — TUMB-L-MATIC, INC. — Catalog sheet describes a line of barrel tumbling equipment for finishing by the dry process

continued on next page

FIBRECOOL

the water soluble
CUTTING FLUID
that has everything

- TRANSPARENT, DOESN'T HIDE WORK.
- COOLS WHILE IT LUBRICATES.
- ACTUALLY PROTECTS FROM RUST.
- NO FOAMING, NO STICKING, NO GUMMING.

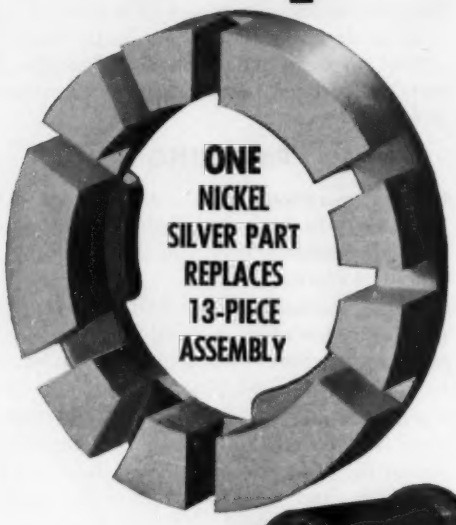
FISKE'S FIBRECOOL Cutting Fluid will help you lower costs through heavier cuts, higher speeds and longer tool life. WORK PROVEN. Produces better finishes in both cutting and grinding. Send for bulletins. Write today.

FISKE'S METAL WORKING LUBRICANTS

FISKE BROTHERS REFINING CO.
129D Lockwood Street, Newark 5, N. J.
Plants: Newark 5, N. J. Toledo 5, Ohio

Circle No. 28 on Reader Service Card

METAL POWDERS CUT COSTS $1.97 per piece



INGENIOUS DESIGN SAVES 95% AND CUTS ASSEMBLY TIME FOR STATOR WINDING AT MINNEAPOLIS-HONEYWELL

Formerly, 13 pieces were machined from brass bar stock and fitted by hand to a plastic ring to provide contact points for this assembly.

TOTAL COST WAS $2.07

CONVERTING TO NICKEL SILVER POWDER, *ONE PIECE,* DELIVERED BY THE FABRICATOR* READY FOR ASSEMBLY, IS EMBEDDED IN PLASTIC, THEN CUT BACK TO EXPOSE THE ACCURATELY-PLACED TERMINALS — COST 10¢.

*Sintered Metals, Inc., Boston.

← It's New!

"DESIGNING FOR PRESSED BRASS AND NICKEL SILVER METAL POWDER PARTS"

WRITE FOR YOUR COPY — it will give you many valuable suggestions for designing parts to obtain the greatest advantages, including economy, for your products.

THE NEW JERSEY ZINC COMPANY
160 Front Street, New York 38, N. Y.

Circle No. 52 on Reader Service Card

USEFUL LITERATURE *continued*

194 **Barrel Media** — LORD CHEMICAL CORP. — 4-page bulletin gives details on pre-formed and natural media for barrel and vibratory finishing, including new formulas for special uses.

195 **Abrasive Finishing** — LEA MFG. CO. — 4-page guide on abrasives for buffing, polishing, burring, and satin finishing. Includes data on additives for bright plating.

196 **Plastic Coatings** — MONSANTO CHEMICAL CO. — 20-page booklet describes how vinyl dispersions, film, or sheeting is used to improve product perform-painting machine, completely air equipped and texture to metal.

197 **Specialty Coatings** — BEE CHEMICAL CO. — Charts list extensive data on the use and application of a line of specialty coatings.

217 **Chromate Coatings** — MAC DERMID INC. — 2-page usage and instruction sheet for a leach-type bright chromate for producing clear bright or iridescent bronze chromate finishes on zinc or cadmium plate.

218 **pH Meter** — ANALYTICAL MEASUREMENTS, INC. — Brochure describes a combined pH meter and strip chart recorder which provides a continuous permanent record of pH changes and automatically compensates for temperature.

COLUMBIA TOOL STEELS

ALCODIE (type H12)—Aluminum die casting die steel keeps your production right side up

Product of Skilled American Workmen

COLUMBIA TOOL STEEL COMPANY
460 Lincoln Highway
Chicago Heights, Illinois

SPOTLIGHTING

A UNIQUE DIE CASTING SERVICE!

Of the many reputable sources for quality zinc and aluminum die castings, the new Advance Pressure Castings Corp. plant at Denville, New Jersey offers a number of sound reasons why APC may be your logical choice when buying such components.

These reasons, which have to do with production experience, the latest in die casting and auxiliary equipment, complete die making facilities and an enviable reputation for service, are fully covered in a new book which you are urged to send for today.

This book may well lead you to economies and advantages in the use of die castings which can greatly increase your competitive position in your field of product manufacture.

ADVANCE PRESSURE CASTINGS CORP.

276 STATE HIGHWAY 53, DENVILLE, NEW JERSEY • PHONES: OAkwood 7-6600 (New Jersey) EVergreen 9-4890 (New York City)

SALES OFFICES: PHILADELPHIA, PA. • DETROIT, MICH. • BUFFALO, N. Y. • ROCHESTER, N. Y. BINGHAMTON, N. Y. • SCHENECTADY, N. Y. • NEW BRITAIN, CONN. • CHICAGO, ILL.

Circle No. 2 on Reader Service Card

Don't orbit stuck castings...use Die Slick!

If your die casting shop engages in long-run production you may be able to standardize on—and save big money on—a pre-mixed, ready-to-use Die Slick compound especially formulated for the particular job. As a 20th Anniversary special we invite you to send us a letter describing your job in detail. We'll send along a trial quantity, tailor-made to your requirements and let you experiment. You be the judge of performance. If the custom sample outperforms a Standard Die Slick Compound—we'll give you a firm per-drum quotation on your "private stock." We guarantee to control quality on subsequent re-orders, and you avoid storing and mixing thinners and other variables. Please shoot us your letter. We can't start until we hear from you, and you're not under any obligation.

Die Slick is a registered trade mark of G. W. Smith & Sons, Inc.

for 20 years

DIE SLICK

used by die casters everywhere

G. W. SMITH & SONS, INC.,

1703 SPAULDING ROAD, DAYTON 32, OHIO

Circle No. 65 on Reader Service Card

INDUSTRY NEWS *continued*

LARGEST ARC-CAST MOLYBDENUM INGOT

The Refractomet Division of Universal-Cyclops Steel Corporation has announced the successful melting of the world's largest arc-cast molybdenum ingot.

The giant ingot, 17 inches in diameter and 69 inches in length weighed 5,000 pounds.

This metallurgical achievement removes production and development barriers formerly confronting the nation's missile and aircraft industry. Now, a significant increase in the size of finished forgings is possible because of the larger forging billet diameters. It may also allow the rolling of much larger sheets and plates where welding or other methods of joining are not desirable.

EXTRUDER ENLARGES PLANT

May, Inc., an aluminum extrusion firm, has added 10,000 square feet of plant space and doubled its office area according to a report in American Metal Market.

The report states that the plant will provide space for additional heat-treating ovens and warehouse facilities, and an expanding engineering staff will use the added office space.

DOW ASSIGNS SPECIALIST TO RAILROAD MARKET

The Dow Metal Products Company, Division of The Dow Chemical Company, announced the assignment of Robert E. Bockrath to a new group developing aluminum and magnesium applications in the railroad industry.

Bockrath currently is located in Los Angeles as a light-metals technical-service field representative for Dow. In his new assignment he will be based at company headquarters in Midland, Michigan. Dow said additional assignments to its railroad group will be announced later.

more industry news on page 100

For Bulletin no. 591 circle No. 101
For Bulletin no. 594 circle No. 102

The Choice is Wide, The Value is High with Hevi-Duty Furnaces

Here are three users of melting and holding furnaces. They represent three methods of casting, using either fuel-firing or electric resistance heating, yet each has found the answer to his needs at Hevi-Duty. This is not surprising.

Hevi-Duty now offers the widest choice of heat processing furnaces — both electric and fuel — in the industry. This is important in terms of furnace value. It means you can probably find a proven unit that fits your needs exactly.

Why not consult a Hevi-Duty Sales Engineer soon? Let him show you why a wide choice means a high value in furnace equipment.

HEVI-DUTY

Electric and Fuel-Fired Industrial Furnaces and Ovens

B P C

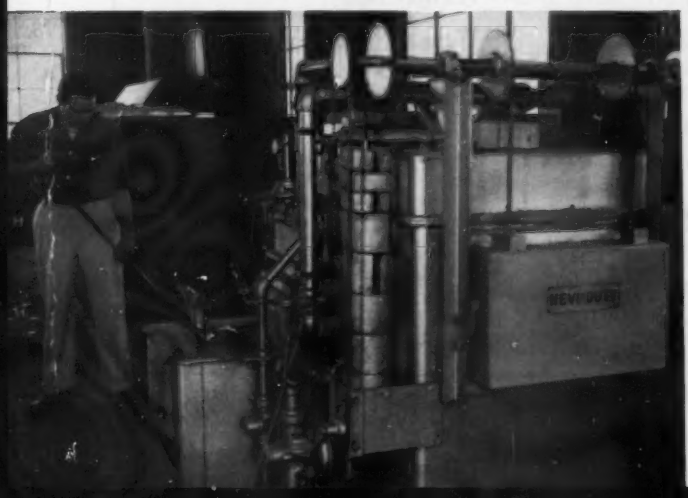
A Division of Basic Products Corporation

Hevi-Duty Electric Company, Milwaukee 1, Wis.

This electric crucible furnace is used by Baso, Inc., Milwaukee, Wisconsin, for holding aluminum at 1240°F. Baso casts components for controls for all types of gas burning equipment from permanent molds. Circular design allows three dip-out stations. There are no exhaust fumes, no bath turbulence, and exterior shell remains relatively cool. ***For complete information on this furnace, write for Bulletin 591.***

A gas-fired, double chamber dry hearth furnace is used for die-casting electric frying pans at the New England Die-Casting Company, West Haven, Conn. Aluminum melts on a sloping hearth and runs into a dip-out chamber where it remains at constant casting temperature. Moisture and volatiles escape during heating. Foreign materials remain on the hearth. This assures clean, high-quality metal on a production line basis. ***Please write today for Bulletin 594.***

Elm City Pattern and Foundry Works, Branford, Conn., uses this dry hearth furnace for sand casting aluminum. Mr. Hal Burkehard, Foundry Manager, likes the way the thermocouple control holds the bath at uniform temperature. He reports that this unit produces cleaner castings than do their other furnaces . . . that he gets only a handful of dross from a 500-lb melt. ***Please request our Bulletin 594.***



Circle No. 29 on Reader Service Card

REJECTS knocking your profits for a loop?

The alloys you're using may be at fault—For good casting results your alloys must fulfill a cons derable number of specific requirements, PLUS all the particular qualities to meet YOUR casting needs.

See how HB&S start-to-finish quality controls guarantee alloys always 100% "on spec" . . . write TODAY for Henning's "Reference Book and Guide on Zamak (Zinc Base) Die Casting Alloys". It's yours for the asking.

YOUR CASTINGS CAN BE NO BETTER THAN THE ALLOYS YOU USE

HENNING BROS. & SMITH, INC.

Dependable service since 1922
91-117 SCOTT AVE., AT RANDOLPH ST.
BROOKLYN, N. Y.
Smelters and Refiners of Aluminum, Bronze, Brass, Zinc, Lead

INDUSTRY NEWS *continued*

SINGER JOINS ICI

The Investment Casting Institute has announced that the Singer Manufacturing Company has become an Allied Member of the ICI. The official representative from Singer is Lloyd E. Raymond, Senior Process Engineer.

The new category of "Allied" membership recently opened by the ICI is available to companies who are users of investment castings. As a member, they are eligible to participate in the many technical programs of the Investment Casting Institute, including the Intra-Industry Research Program, the standardization programs, and are eligible to attend technical meetings and seminars.

Manufacturers who are using investment castings in their products who are interested in participating in the technical programs of the Investment Casting Institute, can obtain further information by writing to the ICI office, 27 East Monroe, Chicago 3, Illinois.

CABRA ELECTS BAKKEN

G. P. Bakken was elected President of the Copper & Brass Research Association at their 38th Annual Meeting. Mr. Bakken, who is President of Chase Brass & Copper Co., succeeds James M. Kennedy, Chairman of the Board of Revere Copper and Brass Inc.

Succeeding Mr. Bakken as Senior Vice President of CABRA is E. P. Dunlaevy, who is Executive Vice President of Phelps Dodge Copper Products Corporation.

OAKITE APPOINTS LAMB

Daniel B. Lamb has been appointed Detroit division manager for Oakite Products, Inc. He replaces Thomas R. Smith, who is retiring after nineteen years as head of the Detroit division.

Mr. Lamb joined Oakite as a technical service representative in Knoxville, Tennessee in 1947. For the past seven years he has served industry in the Kokomo, Indiana area.

more industry news on page 102

Serving the Die Casting Industry

SINCE 1944 . . .

with . . . a complete line of interchangeable replacement parts for the injection end of aluminum and zinc die casting machines

THESE REX-BUCKEYE ENGINEERED PRODUCTS . . .

- Goosenecks
- Nose Inserts
- Plungers
- Piston Rings
- Plunger Couplings
- Nozzles
- Machine & Breakdown Pots
- Shot Sleeves
- Plunger Tips
- Plunger Rods

Complete rework service on goosenecks, plungers, shot sleeves and plunger tips.

R·B

For All Types & Sizes of Die Casting Machines

Rex-Buckeye Co.

ATlantic 1-6718
2109 W. 41st ST., CLEVELAND 13, OHIO

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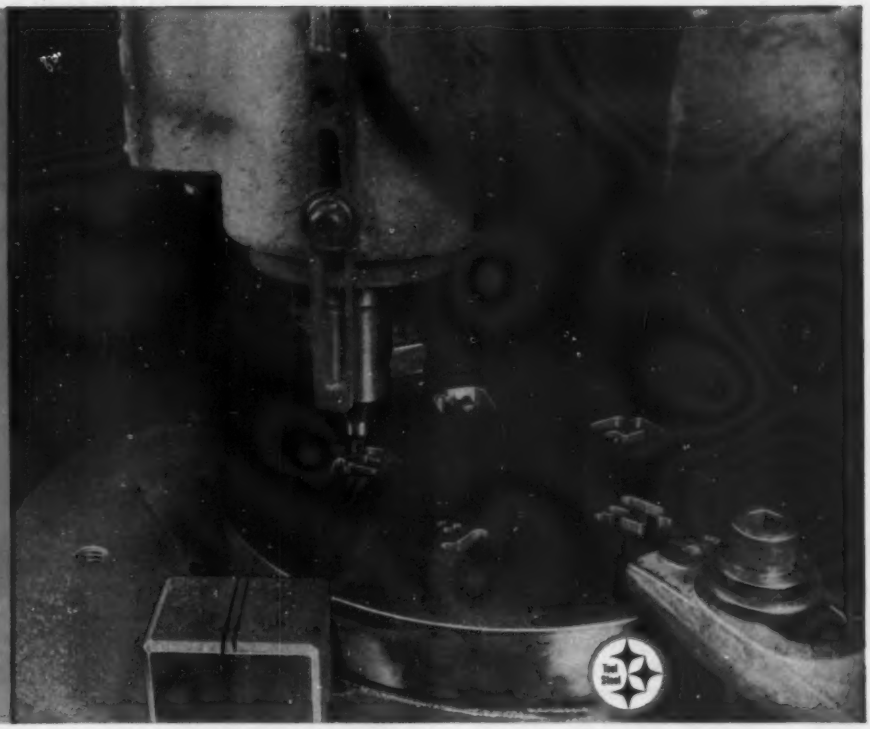
Latrobe's EXTRUSION TOOL STEELS



Dependable... easy to machine... readily available in the size you need!

When your extrusion schedule calls for fast delivery of a die steel to do the job, you can cut production time by calling your nearby, fully-stocked Latrobe steel service center for prompt attention. Whether for regular run production or specialized application, there's a Latrobe grade and size practically at your fingertips.

Latrobe's Extrusion Tool Steels are always dependable . . . easy to saw, file and machine . . . Reflectoscope inspected to guarantee internal soundness . . . made to give you the kind of extrusion production service you want!

Wide range of stock sizes available in these grades:

LPD • Type H-12 die steel
VDC • Type H-13 die steel
VISCOUNT 20 • free-machining Type H-13 die steel
VISCOUNT 44 • prehardened, machinable Type H-13 die steel

Call your Latrobe steel service center today for prompt service and technical assistance . . . or write for literature about individual grades.

MEMBER OF AEC ALUMINUM EXTRUDERS COUNCIL

Skillfully made in U.S.A. by . . .

LATROBE Metalmasters

LATROBE STEEL COMPANY
LATROBE, PENNSYLVANIA

BRANCH OFFICES and STEEL SERVICE CENTERS: BOSTON • BUFFALO • CHICAGO CLEVELAND • DAYTON • DETROIT • GRAND RAPIDS • HARTFORD • LOS ANGELES • MIAMI MILWAUKEE • NEW YORK • PHILADELPHIA • PITTSBURGH • SAN LEANDRO • TOLEDO YOUNGSTOWN

Circle No. 96 on Reader Service Card

INDUSTRY NEWS *continued*

RESEARCH PROGRAM INVESTIGATES WEAR

Fundamental research to develop a metal-wear science has united ten firms in a program under way at Armour Research Foundation.

Sponsors of the research to investigate the causes of wear and friction are American Steel Foundries, Bethlehem Steel Company, Briggs and Stratton Corp., Clevite Corp., Dow Chemical Company, Inland Steel Company, International Harvester Company, International Nickel Company, Socony-Mobil Oil Company, and United States Steel Corp.

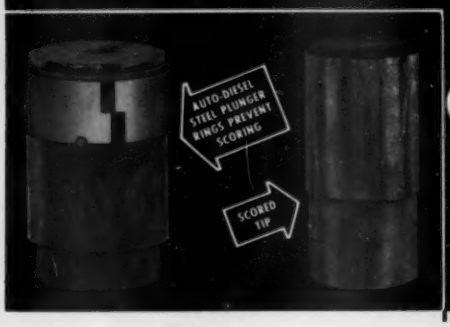
FOOTE TO BUILD ELECTROMANGANESE PLANT

Foote Mineral Company announced that it has authorized the construction of a 20 million pound per year electrolytic manganese facility at its new Johnsonville, Tennessee plant site. The new plant will eventually represent a capital investment of over $6 million, according to Gordon H. Chambers,

more industry news on page 104

Circle No. 91 on Reader Service Card

NEW TIP & RING PLUNGER COMBINATION



6 MONEY SAVING ADVANTAGES

Greater Efficiency

Solves problem of scored or worn tips—saving thousands of dollars per year for the die casting industry.

Beryllium copper and steel plunger rings on piston tips result in maximum service life.

1. Longer wear
2. Denser castings
3. Eliminates aluminum pick-up on sleeves
4. Reduces tip changing down-time
5. Eliminates buying or making new tips
6. You can salvage and use your old tips

Catalog on Request

Plus—Auto-Diesel now offers stainless steel liners for goosenecks—increasing present life 4 to 1—literature on request.

THE AUTO-DIESEL PISTON RING CO.
3141 Superior Avenue • Cleveland 14, Ohio

PICTURED ABOVE IS OUR MODERN SHOP AND OFFICES

exclusively devoted to engineering and building die casting dies and molds to exacting specifications. This plant was designed with capacities to handle and fabricate anything from a unit die insert to a 15 ton cylinder or grille die with the necessary skills and experience to save you time and money on your next tool.

RICHARD O. SCHULZ CO.
ELMWOOD PARK, ILLINOIS
DIE CASTING DIES • PLASTIC INJECTION AND COMPRESSION MOLDS

Circle No. 63 on Reader Service Card

DOLLIN Die-casting Prices are LOW

because we produce *better* Die-castings!

Anyone can cut prices on die-castings by cutting corners on quality and services. But DOLLIN keeps prices down by exhaustively exploring every possibility to improve or simplify the design—make it more practical—reduce weight—add strength—combine parts—eliminate secondary operations—save on assembly and finishing costs.

DOLLIN gets the fullest potential out of every die-casting design and part, through the imaginative skill and experience of its engineers, diemakers and production craftsmen—and the modern machines and progressive methods with which they work.

For over a quarter-century, leading manufacturers in every field have found DOLLIN the ideal source for high-quality, high-volume zinc and aluminum die-castings, from large sizes down to fractions of an ounce.

Let DOLLIN help you get the most for your die-casting dollar. Submit prints or samples of parts for engineering advice and quotation, without obligation. Write for 16-page Facilities Brochure illustrating and describing Dollin's services, facilities and equipment.

RESEARCH PARTICIPANT

DOLLIN CORPORATION, 614 So. 21st St., Irvington 11, N. J.

Sales Offices: Boston • Buffalo • Canton • Chicago • Detroit
Greensboro • Louisville • Memphis • Philadelphia • St. Paul
See "Yellow Pages" for nearest office.

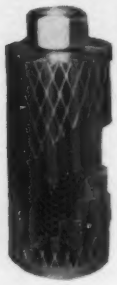
DOLLIN Zinc & Aluminum DIE-CASTINGS

Circle No. 24 on Reader Service Card

MARVEL
SYNCLINAL FILTERS

FOR DEPENDABLE PROTECTION on all Hydraulic and other low pressure circulating systems

Designed to give more ACTIVE filtering area—MORE dependable protection—MORE productive operation before cleaning is necessary. *Meet J.I.C. Standards.*



Synclinal SUMP TYPE

CAPACITIES: 5—8—10—20—30—50—75 and 100 G.P.M.
PIPE SIZES: ¾"—1"—1¼"—1½"—2"—2½" and 3".
CONNECTIONS: Coupling—Male Nipple.
BY-PASS VALVE: Not Available.

Synclinal LINE TYPE

CAPACITIES: 5—8—10—20—30—50—75 and 100 G.P.M.
PIPE SIZES: ¾"—1"—1¼"—1½"—2"—2½" and 3".
BY-PASS VALVE: Not available.
OPERATING PRESSURES: Up to 80 p.s.i.

Bonded SUMP TYPE

CAPACITIES: 10—20—30—50 and 75 G.P.M.
PIPE SIZES: 1"—1¼"—1½"—2"—and 2½".
CONNECTIONS: Coupling—"O" Ring—Male Nipple.
BY-PASS VALVE: Available with or without

Bonded LINE TYPE

CAPACITIES: 10—20—30—50 and 75 G.P.M.
PIPE SIZES: 1"—1¼"—1½"—2" and 2½".
BY-PASS VALVE: Available with or without.
OPERATING PRESSURE: Up to 250 p.s.i.
OPERATING TEMPERATURES up to 300° F.

Tandem SUMP TYPE

CAPACITIES: 10—16—20—40—60—100—150 and 200 G.P.M.
PIPE SIZES: ¾"—1"—1¼"—1½"—2"—2½" and 3".
CONNECTIONS: Coupling—Male Nipple.
BY-PASS VALVE: Not available.

IN-LINE FILTER

CAPACITIES: Up to 60 G.P.M.
PIPE SIZES: ¾"—1"—1¼" and 1½" (at both inlet and outlet).
BY-PASS VALVE: Available with or without

FILTERING MEDIA in all Marvel Filters is Monel wire cloth available in mesh sizes of 30-40-50-60-80-100-150 and 200 to meet your filtration requirement.
EASY TO CLEAN—All Marvel Filters are easy to clean. Line type units operate in any position and may be serviced without disturbing pipe connections.
OVER 900 O. E. M's. install Marvel Filters as Standard Equipment.

IMMEDIATE DELIVERY

For further information on a specific type filter—Write—wire or phone

MARVEL ENGINEERING COMPANY
7227 N. Hamlin Ave., Chicago 45, Ill.
Phone: JUniper 8-6023

Please send me information on Marvel Filters as indicated: (PMM-9)

☐ Hydraulic Oils ☐ Coolants ☐ Lubricants ☐ Fire Resistant Fluids
☐ Water ☐ Sump Type ☐ Line Type ☐ In-Line

Name_____
Company_____
Address_____
City_____ State_____

Visit **our booth #253** Production Engineering Show, Chicago, Sept. 6-16

INDUSTRY NEWS *continued*

Board Chairman, and will add to the capacity of two existing Foote plants at Knoxville, Tennessee.

The plant will be built in two stages, and the first unit of 10 million pounds per year is expected to be on stream in late 1961 or early 1962. A number of technological improvements, resulting from a major research effort over the past four years will be incorporated into the plant's design.

Chambers stated that while domestic electrolytic manganese capacity is currently adequate to supply the metallurgical industry, Foote's additional capacity is being developed in anticipation of increased use here and abroad. Electrolytic manganese is used in the production of stainless, specialty and mild steels, and in non-ferrous alloys.

URAM JOINS HITCHINER

URAM

Stuart Z. Uram, holding S.B., S.M. and ScD. degrees from the Metallurgy Department of the Massachusetts Institute of Technology, has joined the Metallurgical staff of Hitchiner Manufacturing Co., Inc. Initially, Uram will work on investment casting developmental projects including new alloys and solidification phenomena. His previous work at M. I. T., American Brakeshoe Experimental Foundry, and at Watertown Arsenal has led to the publication of several technical papers on solidification and the relation of metal structures to properties.

more industry news on page 106

METAL POWDER PARTS SOLVE DESIGN PUZZLES

By making possible many of the intricate structures essential to modern equipment planning . . . and by substantially *reducing the cost* of those parts . . . powdered metallurgy has overcome two important problems facing the design engineer. More important, while effecting savings in material, manpower and machinery, the metal powder process is producing parts of finer quality and closer tolerances . . . certain parts cannot be made by any other method.

Metals Disintegrating Company will supply any manufacturer, anywhere in the world, a specific grade of powder in aluminum, tin, copper and other metals or alloys in a wide range of particle sizes. Our laboratory facilities are at your service to help you select the correct grade and material for your product.

METALS DISINTEGRATING COMPANY
Division of American-Marietta Company
General Offices, Department O, Elizabeth 8, N. J.

Circle No. 45 on Reader Service Card

Circle No. 27 on Reader Service Card

another unique GRC die cast zinc alloy component

this movable Intercast® element unit was

cast-assembled in one operation

by GRC

GRC's unique patented INTERCAST method die casts multiple-part zinc-alloy units with moving elements in a single, automatic, time-saving, money-saving operation . . . even continuously interlocked assemblies. Units leave the machine complete, ready for immediate use.

This INTERCAST technique is an ingenious refinement of GRC's exclusive method of small parts die casting—providing broad design latitude, close tolerances, economies in quantities of 100,000 and more.

Let GRC solve your problems. No size too small Maximum length 1¾", maximum weight: ½ oz. ***Send TODAY for samples, prices and fact-filled bulletin.***

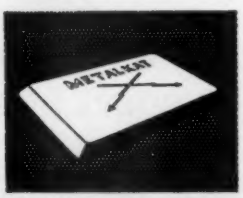
World's Foremost Producer of Small Die Castings

GRIES

GRIES REPRODUCER CORP.

157 Beechwood Ave., New Rochelle, New York • NEw Rochelle 3-8600

SELLERS OF



'METALKAT'

BRAND ELECTROLYTIC ZINC

SPECIAL HIGH GRADE 99.995% +

HIGH GRADE 99.95%

INDUSSA CORPORATION

511 Fifth Avenue New York 17, New York Tel: MUrray Hill 2-4680

Cable: Indussa New York Telex: 4301 New York

Circle No. 37 on Reader Service Card

INDUSTRY NEWS *continued*

OLIN APPOINTS DISTRIBUTOR

Appointment of Hunter & Havens, Inc., Bridgeport, Conn., as a distributor for Olin Aluminum, has been announced by Hollis B. Cranmer, manager of aluminum distributor sales, Metals Division, Olin Mathieson Chemical Corp.

The company will market Olin Aluminum rod, bar and extrusions throughout Connecticut and will add Olin Aluminum sheet and tubing later this summer.

FOUNDATION AWARDS 24 SCHOLARSHIPS

E. A. Garber, President of Harbison-Walker Foundation, Inc. has announced the awarding of scholarships to 24 sons and daughters of the Company's employees. This raises to 54 the number of recipients who will be attending various Colleges and Universities this Fall with financial assistance from the Foundation. The Foundation's program of giving financial assistance to children of Harbison-Walker employees was begun in 1953.

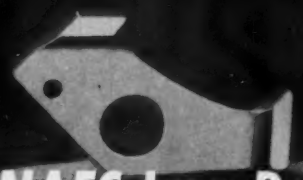
KAISER EXPANDS HIGH PURITY ALUMINUM PLANT

Production of super purity aluminum is being tripled at Kaiser Aluminum & Chemical Corporation's Mead, Wash., reduction plant with the installation of six new refining cells. Construction of the specially designed cells currently is underway, and actual production is expected to begin in September.

JOHNSON BRONZE LICENSES S. AMERICAN FIRM

Johnson Bronze International, Inc. a subsidiary of Johnson Bronze Company has signed a licensing agreement with Sintermetal, S.R.L. in Buenos Aires, Argentina. Sintermetal is an established manufacturer of bearings and bushings made from copper lead strip, with two plants in Buenos Aires. Under the terms of this agreement, Johnson Bronze will furnish technical data, engineering assistance and permit Sintermetal to use the Johnson name.

more industry news on page 108



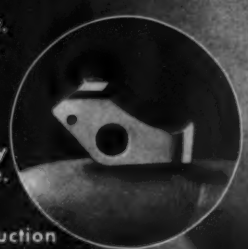
HOEGANAES Iron Powders *helped to eliminate the big production problems from this small verg pawl - -*

GENERAL SINTERING CORPORATION* solved the production problems, even though previous powder metallurgy attempts had failed.

Here's where production know-how, and the selection of Hoeganaes Iron Powders, paid off. And General Sintering Corporation *relied solely on their standard blend of Hoeganaes Iron Powders.*

These are the problems that defeated previous production attempts . . .

- Part had to be pressed to high density SAE-6, to the high side.
- Verg Pawl had to be carburized, hardened and drawn.
- Even density was required throughout part.
- Flow of material must insure adequate die fill to produce the high density required in the working knife edges.
- The limited thickness and the required density called for uniform apparent density of the iron powder to prevent tool damage.



When you're faced with equally tough production problems—here are two important points to remember. First, like General Sintering Corporation, rely on Hoeganaes Iron Powders for trouble-free production. And rely on the Hoeganaes Service Engineer as your working partner . . . he's a good man to have on your team.

*General Sintering Corporation is located at 3907 Wesley Terrace, Schiller Park, Illinois. Mr. Vernon J. Pingel is Manager and Metallurgical Engineer.

H S I C

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HOEGANAES SPONGE IRON CORPORATION

RIVERTON, NEW JERSEY

SALES REPRESENTATIVES IN PRINCIPAL CITIES: Birmingham, Chicago, Cincinnati, Cleveland (Fostoria), Edmonton (Alberta, Canada), Montreal (Canada), Toronto (Canada), Los Angeles, Mexico 16, D. F. (Mexico), Minneapolis, New England (Elmira, N. Y.), Odessa (Texas), Philadelphia (Riverton, N. J.), Pittsburgh, San Francisco, St. Louis

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Reverbale CONTINUOUS Melting & Holding DIP-OUT Furnaces

Increase Production . . . Promote Cooler, Safer Operating Conditions

*Operating efficiencies up to 75% are easily achieved, due entirely to the design of the refractory lining.
*X-ray inspection proves castings have lower dross inclusions.

Reverbale's cooler . . . safer working conditions mean uniform work rate. No loss in operator efficiency due to heat fatigue.

Output: up to 300 lbs. or 900 lbs. per hour

20-page Brochure "Efficiency in Melting" mailed on request.

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CANADIAN AGENT: DREW BROWN LTD., 5410 Ferrier St., Montreal 9

INDUSTRY NEWS *continued*

BOHN APPOINTS SALES MANAGER

Walter T. Miiller has been named Chicago District Sales Manager of Bohn Aluminum & Brass Corporation. Miiller will supervise sales in Greater Chicago, northern Illinois, and Iowa, of all of Bohn's product line except heat transfer products. He is a graduate engineer of Northwestern University School of Engineering and has been associated with Bohn for the past eight years.

BLUM HEADS AMCO BOSTON OFFICE

Frank Blum has been appointed Manager of the Boston office of the AMCO Division of American Metal Climax, Inc. He replaces Sheldon Tauben who has undertaken new duties in the scrap buying field in the Chicago office.

Mr. Blum is a graduate of the Institute of Applied Arts and Sciences. He joined AMAX in 1956 as a scrap buyer and covered territories for the New York office.

more industry news on page 110

PARAMOUNT Die Castings AT WORK
No. 5 of a Series

Pump Housing

Gear Case Cover

Filter Handle

RCA-Whirlpool Imperial Mark XII Automatic Washer

PARAMOUNT— a major supplier of die castings to Whirlpool Corporation for 15 years

Whirlpool quality is recognized throughout the world, quality which stems from the rigid quality standards which Whirlpool demands that its suppliers meet.

Paramount's engineering and production "know-how", its ability to consistently meet Whirlpool's exacting quality standards—as in these die castings for the RCA-Whirlpool Imperial Mark XII Automatic Washer—are the reasons why Paramount has consistently been one of Whirlpool's major suppliers for 15 years.

It Will Pay You To Look to Paramount . . .

If your product incorporates die castings or you're considering them—investigate Paramount's complete services.

Three complete plants—two in St. Joseph, Mich., one in Seymour, Indiana.

SEND For "Designing for Die Casting"

PARAMOUNT Die Casting Co.

(A subsidiary of TALON, INC.) ST. JOSEPH, MICHIGAN

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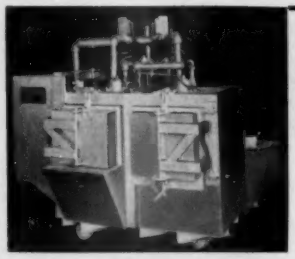

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RADIANT ALUMINUM BREAKDOWN AND HOLDING FURNACES

UNEQUALLED FOR LOW POROSITY ALUMINUM CASTINGS

Exclusive Kozma "Pre-Temp" charging and subsurface metal flow practically eliminates oxygen and hydrogen pick-up and oxide inclusions, keeping metal at high purity level.

Radiant firing provides faster, more uniform heat distribution, eliminates flame impingement and reduces fuel costs.

Kozma Model RSHCH Furnaces range in capacity from 300 to 2,000 lbs. per hour with design variations to meet your requirements. Write today for details on this new furnace.

Also new from Kozma — Automatic Ladling Unit

Low Cost
Fast
Accurate

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2471 WYOMING
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Industrial Processing Furnaces Since 1928

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3½ lbs. WAX CAPACITY
ON STANDARD MODEL #FSIWP

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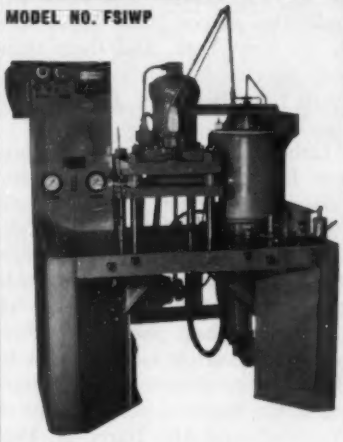
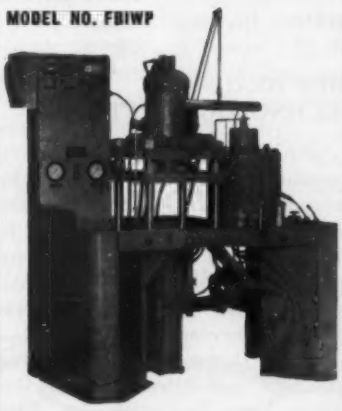
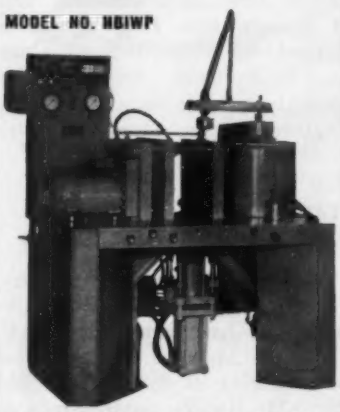


MODEL NO. FBIWP



MODEL NO. HBIWP



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Any Type or Size Unit Built to Your Specifications.

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SAVE 70% with MASTER-MOLD

MASTER-MOLD WORKS FOR YOU to bring overhead and operating costs down to a realistic level. **MASTER-MOLD** can save you up to 70% because this new technique eliminates expensive die sets and other costly equipment — slashes set-up time, labor costs . . . **handles two jobs at once.**

Short runs can be handled profitably! Short runs, long runs can be combined, run together — doubling your machine capacity!

Now you can add to your customers the many small manufacturers and experimental workers who cannot bear the cost of conventional die-casting methods.

. . . write for complete information, or order direct.

RICHARDS TOOL AND MOLD CO.

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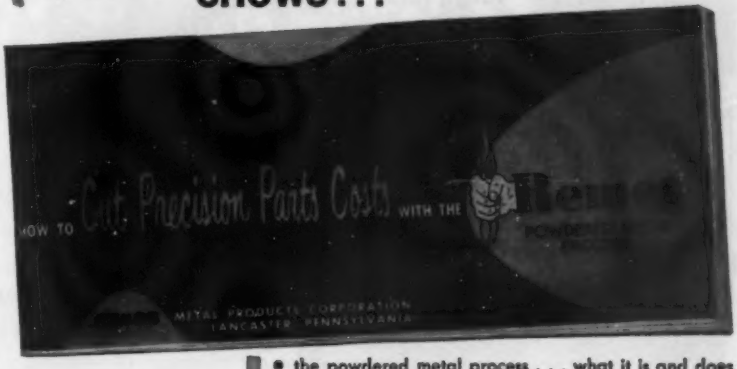
FREE POWDERED METAL PARTS BOOKLET SHOWS . . .



colorful, newly revised 16-page booklet illustrates and describes:

- the powdered metal process . . . what it is and does
- gives limitations and advantages of the powdered metal process
- shows design DO's and DON'T's for powdered metal parts
- provides physical characteristics chart of standard Remet materials
- plus specific application stories

Send for your copy of this helpful booklet today!

Remet

REESE METAL PRODUCTS CORPORATION

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Gears • Pinions • Cams • Ratchets "Oilless" Bearings • Bushings • Machine and Structural Parts in COPPER • BRASS • IRON • ALLOY STEEL • NICKEL SILVER • COPPER INFILTRATED IRON

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SMELTERS CHARGE INEFFECTIVE

The scrap aluminum export rate for the first four months of 1960 climbed to almost four times that of the same period last year. This poses a serious threat to the domestic secondary industry according to the Aluminum Smelters Research Institute.

In wires to the U.S. Department of Commerce and the Congressional Subcommittee on Small Business, ARI also pointed out that the April, 1960, export rate was a record 16.3 million pounds—almost 50 per cent more than the rate reported at the May hearing.

During the months in which the Commerce Department had promised to maintain a close watch over tonnage flow, said ASRI, the export rate has jumped higher and faster than ever before. The fact that the department reported exports averaging 11 million pounds per month while actual March and April figures were 15.2 and 16.3 million is an indication of an ineffective monitor system, ASRI charged.

ASRI pointed out that the major reason for concern is that the growth rate of domestic scrap supply lags far behind the growth rate of scrap exports. In fact, the smelter group stated, the Commerce Department itself has estimated that scrap availability this year will increase only about 10 per cent over that of 1959.

LITHIUM MOVES HEADQUARTERS

Lithium Corporation of America, Inc. has moved their executive and sales offices from Minneapolis, to New York, and their technical service branch has been relocated at Bessemer City, North Carolina.

Lithium Corporation's production facilities have already been moved to Bessemer City, and their research and development laboratories are also being moved there.

"These moves have been made to give Lithium Corporation of America the best possible production and research facilities and to place the corporation's headquarters in the financial nerve center of America," said Mr. Harry D. Feltenstein, Jr., president of LCA.

GILL HEADS TECHNOLOGY DEPT.

John G. Gill has been appointed Assistant Director—Process Development in Crucible Steel Company's Technology Department. In his new position Mr. Gill will supervise the planning, evaluation and coordination of all process technical development activities.

Mr. Gill was formerly Vice President and Director with Canadian Steel Improvements, Ltd. of Toronto, Ont. Prior to this he worked for United Steel Companies, Sheffield, England, and spent four years as a Consulting Engineer in the Canadian Maritime Provinces.

CLIMAX MOLYBDENUM NAMES RUNDLE MANAGER

Climax Molybdenum Company, a division of American Metal Climax, Inc., has named Donald F. Rundle as Manager, Metallurgical Development at its Chicago field office. Mr. Rundle assumes responsibilities for the coordination of developments involving molybdenum alloy irons and steels in the tractor, oil field equipment, and railroad industries.

Formerly managing engineer of Chrysler Corporation's metallurgi-

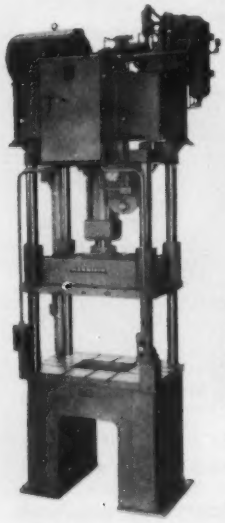
HANNIFIN

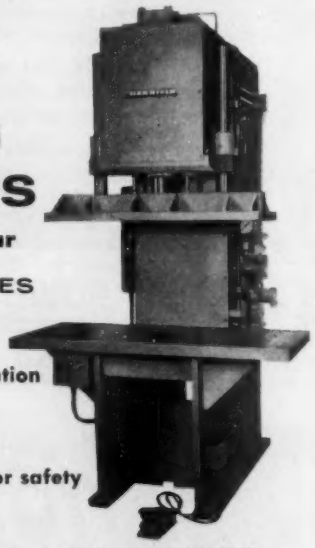
HYDRAULIC

DIE CASTING TRIM PRESSES

Give you more parts per hour

OPEN GAP OR COLUMN TYPES





- High speed operation
- Easier set-up
- Longer die life
- Complete operator safety
- 2 to 150 tons

Faster Speeds • Lower Prices • Quick Delivery

YOU GET THESE FEATURES:

1. Safe, dual electric (or hand) controls
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3. Adjustable ram pressure
4. Extra-large tables standard
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For the full story of the advantages of high speed hydraulic trimming, send for our Bulletin 142. Or call in your Hannifin representative—he's a trained production analyst.

3164PH

PARKER-HANNIFIN CORPORATION

HANNIFIN COMPANY

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CENTRAL POINT IN THE NATION FOR FLUID POWER APPLICATION

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cal research department, he had also been associated previously with Campbell Wyant and Cannon Foundry Company.

A graduate of Michigan State University where he also pursued graduate studies in metallurgy, Mr. Rundle is presently chairman of Panel B, Iron and Steel Committee of the Society of Automotive Engineers. He is also a member of the American Foundrymen's Society, American Society for Metals, and American Institute of Mechanical Engineers.

CRUCIBLE STEEL NAMES DIRECTOR OF METALLURGY

Eugene A. March, formerly Assistant Works Manager at the Crucible Steel Company's Midland plant, has been appointed the Company's Director of Metallurgy. He succeeds E. T. Walton who will retire in June.

The position vacated by Mr. March at Midland Works will be filled by Lawton Howell, formerly Assistant Controller in Crucible's General Offices in Pittsburgh.

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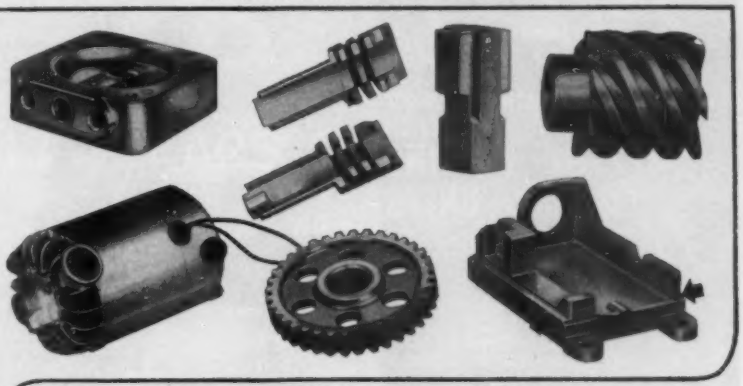

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A pioneer in the die casting art, *Milwaukee* has long been a recognized leader in supplying *Die Castings as Specified* to all types of industry for all types of products from small precision instruments to massive heavy duty machinery. That is why you can entrust *Milwaukee* to produce die cast parts to your most exacting specifications — not only in dimensions — but in contour, weight, strength, pressure resistance, wear resistance, finish and other vital characteristics.

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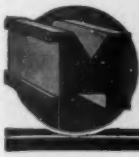
4146 N. HOLTON STREET • MILWAUKEE 12, WISCONSIN
Established 1909



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Increase your profits with DFC crucibles & funnels

Since 1876, DFC has furnished crucibles, clay goods, and accessory materials which have set *standards of quality the world over.* More recently the unanimous acceptance and wide use of DFC transfer crucibles and funnels by the precision casting industry, is high testimony to their economy and dependability.

For precision casting...lost wax, investment and permanent mold. Transferring, pouring, spouting... there is a DFC crucible or funnel to meet your exact needs.

If you have a special crucible problem, let us work on it for you.

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The DENVER FIRE CLAY COMPANY DFO-5
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Please send me further information on your full line of crucibles.

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Company.....
Address.....
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HIGH FREQUENCY INDUCTION HEATING UNITS

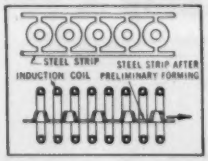
Lepel induction heating equipment represents the most advanced thought in the field of electronics . . . the most practical and efficient source of heat developed for numerous industrial applications. You are invited to send samples of work with specifications. Our engineers will process and return the completed job with full data and recommendations without cost or obligations.

TYPICAL INDUCTION HEATING APPLICATIONS

PLASTIC COATING OF TOOL HANDLES

A production line operation for coating handles of tools at Whitney Metal Tool Co., Rockford, Ill. uses induction heating with excellent results. The handles only are heated by induction to the desired temperature then dipped into a vinyl chloride base coating material for a short period depending upon the thickness of coating desired. The plastic coating formed on the handles is then cured by immersion in a carbo-wax bath.

FORMING OF METAL STRIP FACILITATED BY PROGRESSIVE ANNEALING



Metal forming operations which require intermediate anneals to restore ductility can be facilitated by induction annealing the strip progressively. Diagram illustrates this procedure for partially formed thin austenitic stainless steel strip. The induction annealing operation is scheduled in the production line between two press operations. Metal strip and wire of other materials are also induction annealed in this manner.

WRITE FOR NEW LEPEL CATALOG
Electronic Tube Generators from 1 Kw to 400 Kw
Spark Gap Converters from 2 Kw to 30 Kw

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Theme Tower Symbol of the 1960 Metal Show

Learn a lot about casting at the NEW METAL SHOW!

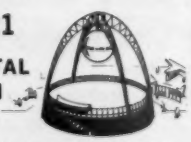
"The problem of keeping abreast of new developments in today's rapidly changing technology is always difficult. The Metal Show, through its audio-visual presentations of current advances in knowledge, presents a time-condensed package for those interested in metals engineering and processing."

R. F. Thomson, Head
Metallurgical Engineering Dept.
Research Laboratories
GENERAL MOTORS CORP.

Center of metals and materials technology — the 1960 Philadelphia Metal Show! Here's your opportunity to see, hear, learn and profit . . . to increase your engineering knowledge in the world of metals. This year, a new emphasis on metals and materials, processes and techniques will create a Metal Show that's truly exciting and different. You can see 300 exhibits and hear 250 technical papers. Urge your friends to go — PLAN NOW TO ATTEND!

October 17-21

NATIONAL METAL CONGRESS and EXPOSITION



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"the HITCHINER way..."

saves 35 MACHINING OPERATIONS with INVESTMENT CASTING

This barrel of a .22 caliber target revolver is now being cast by Hitchiner's new ceramic shell process. This new investment casting technique provides sufficient close tolerances and finishes to eliminate the need for 35 machining operations. Gun barrel tolerance of 0.006 inch was normal, but plus over minus 0.001 inch was maintained on certain areas. Only external finishing needed was partial polishing.

These savings have allowed the manufacturer of this revolver to sell it for considerably less than a similar previous model.

Through investment casting, parts can be designed for function and maximum operating efficiency with the widest selection of alloys from which to choose. This freedom from manufacturing problems can result in more flexibility in design and less waste in production.

Send us a sample or blueprint and check your specific problem with our "engineered quotation" — no obligation, of course.

Find out how our new ceramic shell technique can possibly benefit you. Send for our free, new revised brochure explaining investment castings.

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MANUFACTURING COMPANY INC.
MILFORD 34, NEW HAMPSHIRE

Coast to Coast Engineering Representatives

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PMM OPPORTUNITIES

jobs & equipment

Opportunities rates: $20 for the first column-inch; $15 for each additional column-inch payable in advance. To answer box number advertisements, address responses to the box at Precision Metal Molding, 812 Huron Road, Cleveland 15, Ohio. Closing date: 1st day of month preceding publication.

REPRESENTATIVES WANTED

Wanted Sales Representative by leading Die Casting Plant doing both Zinc and Aluminum, with assembly, plating and painting facilities. Plant located in Southeast United States. Require extensive national coverage. Box 9260.

SALES ENGINEER—DIE CASTINGS

Well established large Eastern die casting company seeking sales engineer for the Rochester, Syracuse, and upper New York area. Technical experience required. Sales experience valuable but not necessary. Box 9460.

POSITIONS OPEN

POWDER METALLURGIST for pre-mixing, material control, research and development work. Experience in iron powder parts manufacturing desirable. Salary open. Location East. Box 9360.

EQUIPMENT

Investment Casting Equipment in Midwest. Standard #668 F Furnace with controls, Inducto Melter, 3-50 lbs and 2-70 lbs Arc Furnaces, Large Belt Sander, Two Wax Injectors, Vacuum Pump, Band Saw, etc., Box 9160.

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COLD SHOT MACHINES — Hydraulic
250 ton Lake Erie, Model AH-250M-210
150 ton Lester Phoenix, 25"h. x 21½"v.
150 ton HM-3, 14" x 14" between bars
150 ton HM-2, 12¾" x 12¾" between bars
150 ton HM-1, 10⅞" x 11" between bars
HOT SHOT — ZINC — Hydraulic
400 ton Kux — Like new
HOT SHOT — ZINC — AIR OPERATED
ABC, DCMT and KUX.

Write, wire, phone — reasonable price and details. All machines in good condition and operating. Inspection invited.

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The knowledge and experience we have gained in the manufacture of crucibles and refractories is freely available to you. Our Field Engineers will be glad to come to your plant, examine your present facilities, and recommend any changes necessary to help you increase the economy and efficiency of your melting operation.

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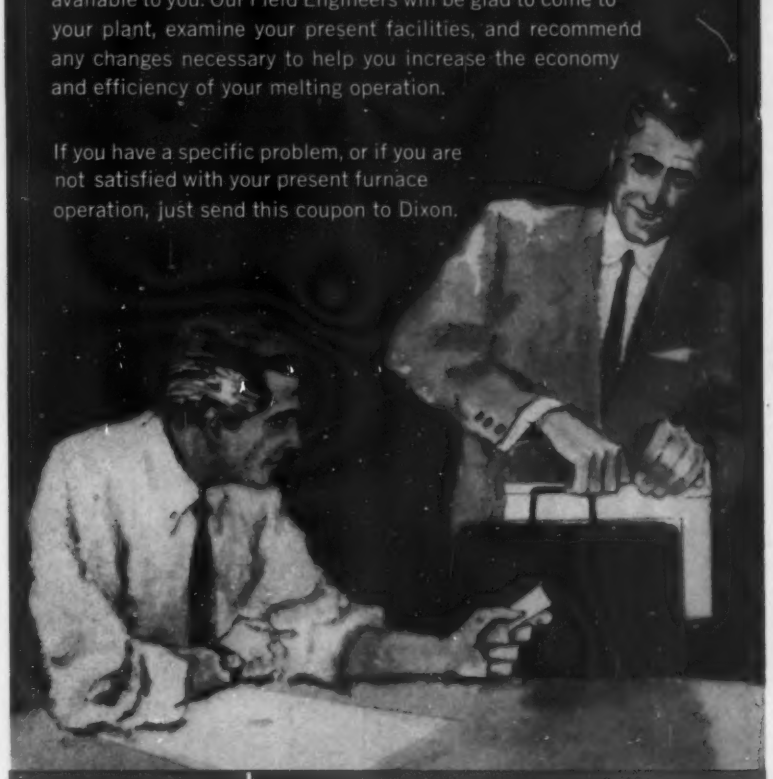

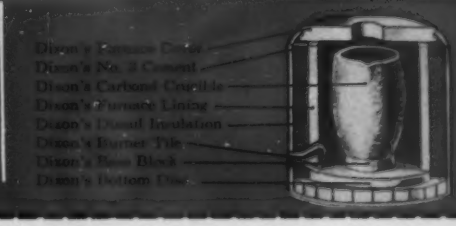

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FIRST in commercial production and sale of zinc base die casting alloy ingot containing 4% aluminum made from high grade zinc. Production started October, 1924.

FIRST to use 99.99 plus pure zinc when it became available in 1928.

FIRST to develop the lower magnesium contents, .03 to .05%, which eliminated the hot shortness characteristics experienced with .10% magnesium and at the same time was sufficient to prevent the intercrystalline corrosion. Apex promoted in 1931 the first ASTM specification written for zinc base die casting alloys.

FIRST to establish and publish information on the effects of metal and die temperatures on different alloy compositions through actual die casting of thousands of test bars. Apex "Metalgrams" showing these effects were initiated in 1931 and continued through 1945.

FIRST to use large capacity refractory lined furnaces for alloying, replacing the conventional iron metal pots. The larger heats established a uniformity of composition not previously attainable. Iron pickup also was eliminated.

FIRST to employ Quantometers—direct reading spectrographs—for rapid and accurate control of alloy composition.

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